



Bibliography



BIBLIOGRAPHY

CHAPTER 1

- [1] E. H. Lieb and J. Yngvason, “The physics and mathematics of the second law of thermodynamics.” *Physics Reports*, vol. 310, no. 1, pp. 1-96, 1999, [https://doi.org/10.1016/S0370-1573\(98\)00082-9](https://doi.org/10.1016/S0370-1573(98)00082-9)
- [2] G. Martínez *et al.*, “Environmental impact of nanoparticles’ application as an emerging technology: A review.,” *Materials*, vol. 14, no. 7, pp. 1–26, 2021, doi: 10.3390/ma14071710.
- [3] R. K. Jha, P. K. Jha, K. Chaudhury, S. V. S. Rana, and S. K. Guha, “An emerging interface between life science and nanotechnology: present status and prospects of reproductive healthcare aided by nano-biotechnology,” *Nano Rev*, vol. 5, no. 1, p. 22762, 2014, doi: 10.3402/nano.v5.22762.
- [4] V. Balzani, “Nanoscience and nanotechnology: A personal view of a chemist,” *Small*, vol. 1, no. 3, pp. 278–283, 2005, doi: 10.1002/smll.200400010.
- [5] ISO 80004-1:2010, “This standard has been revised by ISO/TS 80004-1:2015,” 2010.
- [6] ISO9241-210, “This standard has been revised by ISO 9241-210:2019,” pp. 6–8, 2010.
- [7] G. Lovestam *et al.*, “Considerations on a definition of nanomaterial for regulatory purposes,” *Joint Research Centre (JRC) Reference Reports*, vol. 24403. 2010. doi: 10.2788/98686.
- [8] European Commission, *Scientific Basis for the Definition of the Term “nanomaterial,”* no. December. 2010. doi: 10.2772/39703.
- [9] BSI, “PAS71-2011-Nanoparticles – Vocabulary,” *BSI Standards Publication*, pp. 1–28, 2011.
- [10] P. Wright, “Standardization: ASTM Releases ‘Terminology for Nanotechnology,’” <https://www.technologylawsource.com/2006/12/articles/nanotechnology/standardization-astm-releases-terminology-for-nanotechnology/>, 2006.

- [11] A. Caiger-Smith, *Lustre Pottery*, First ed., New Amsterdam, New York, NY, United States, 1991.
- [12] A. Reiss, G. Hutten, Magnetic nanoparticles. in: K.D. Sattler (Ed.), *Handbook of nanophysics: Nanoparticles and Quantum Dots*, CRC press. 2010.
- [13] J. Pérez-Arantequi *et al.*, “Luster pottery from the thirteenth century to the sixteenth century: A nanostructured thin metallic film,” *Journal of the American Ceramic Society*, vol. 84, no. 2, pp. 442–46, 2001, doi: 10.1111/j.1151-2916.2001.tb00674.x.
- [14] D. J. Barber and I. C. Freestone, “An investigation of the origin of the colour of the lycurgus cup by analytical transmission electron microscopy,” *Archaeometry*, vol. 32, no. 1, pp. 33–45, 1990, doi: 10.1111/j.1475-4754.1990.tb01079.x.
- [15] M. Reibold *et al.*, “Structure of several historic blades at nanoscale,” *Crystal Research and Technology*, vol. 44, no. 10, pp. 1139–1146, 2009, doi: 10.1002/crat.200900445.
- [16] D. E. Arnold, “Maya Blue and palygorskite: A second possible pre-Columbian source,” *Ancient Mesoamerica*, vol. 16, no. 1, pp. 51–62, 2005, doi: 10.1017/S0956536105050078.
- [17] A. K. Yetisen *et al.*, “Art on the nanoscale and beyond,” *Advanced Materials*, vol. 28, no. 9. Wiley-VCH Verlag, pp. 1724–1742, Mar. 02, 2016. doi: 10.1002/adma.201502382.
- [18] A. Vaughan, “Raman nanotechnology - The lycurgus cup,” *IEEE Electrical Insulation Magazine*, vol. 24, no. 6. p. 4, 2008. doi: 10.1109/MEI.2008.4665344.
- [19] M. Faraday, “The Bakerian Lecture. —Experimental relations of gold (and other metals) to light,” *Philos Trans R Soc Lond*, vol. 147, pp. 145–181, 1857, doi: 10.1098/rstl.1857.0011.
- [20] C. Sanchez, K. J. Shea, S. Kitagawa, and U. Schubert, “Hybrid materials themed issue Cluster-based inorganic-organic hybrid materials,” *Chem. Soc. Rev*, vol. 40, no. 2, p. 575, 2010.
- [21] R. P. Feynman, “There’s plenty of room at the bottom,” *Engineering and Science magazine*. 1960. doi: 10.1201/9780429500459.

- [22] M. C. Lea, "On allotropic forms of silver," *Am J Sci*, vol. s3-38, no. 223, pp. 47–49, 1889, doi: 10.2475/ajs.s3-38.223.47.
- [23] K. Boese, "Über Collargol, seine Anwendung und seine Erfolge in der Chirurgie und Gynäkologie," *Deutsche Zeitschrift für Chirurgie*, vol. 163, no. 1–2, pp. 62–84, 1921, doi: 10.1007/BF02801881.
- [24] B. Nowack, H. F. Krug, and M. Height, "120 years of nanosilver history: Implications for policy makers," *Environ Sci Technol*, vol. 45, no. 4, pp. 1177–1183, 2011, doi: 10.1021/es103316q.
- [25] Z. V. Moudry, "Process of producing oligodynamic metal biocides," *United States Patent Office*, p. 2,927,052, 1953, doi: 10.1145/178951.178972.
- [26] P. Shapira and J. Wang, "R & D Policy in the United States: The Promotion of Nanotechnology R & D," *Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments: The "Policy Mix" project*, no. December, p. 28, 2007.
- [27] P. Christopher and N. Toumo, "Industrial renewal and growth through nanotechnology?-an overview with focus on Finland," 2006. [Online]. Available: <http://www.etla.fi/>
- [28] T. Y. Poh *et al.*, "Inhaled nanomaterials and the respiratory microbiome: Clinical, immunological and toxicological perspectives," *Part Fibre Toxicol*, vol. 15, no. 1, pp. 1–16, 2018, doi: 10.1186/s12989-018-0282-0.
- [29] H. Gleiter, "Nanostructured materials: Basic concepts and microstructure," *Acta Mater*, vol. 48, pp. 1–29, 2000, doi: 10.1201/9780203390283.
- [30] V. V. Pokropivny and V. V. Skorokhod, "Classification of nanostructures by dimensionality and concept of surface forms engineering in nanomaterial science," *Materials Science and Engineering C*, vol. 27, no. 5-8 SPEC. ISS., pp. 990–993, 2007, doi: 10.1016/j.msec.2006.09.023.
- [31] O. I. Sekunowo, S. I. Durowaye, and G. I. Lawal, "An Overview of Nano-Particles Effect on Mechanical Properties of Composites," *World Academy of Science, Engineering and*

Technology International Journal of Animal and Veterinary Sciences, vol. 9, no. 1, pp. 1–7, 2015.

- [32] A. Ali and A. Andriyana, “Properties of multifunctional composite materials based on nanomaterials: a review,” *RSC Adv*, vol. 10, no. 28, pp. 16390–16403, 2020, doi: 10.1039/c9ra10594h.
- [33] R. K. Shatrohan Lal, “Synthesis of organic nanoparticles and their applications in drug delivery and food nanotechnology: a review,” *Journal of Nanomaterials & Molecular Nanotechnology*, vol. 03, no. 04, 2014, doi: 10.4172/2324-8777.1000150.
- [34] L. Guo, H. Wang, Y. Wang, F. Liu, and L. Feng, “Organic polymer nanoparticles with primary ammonium salt as potent antibacterial nanomaterials,” *ACS Appl Mater Interfaces*, vol. 12, no. 19, pp. 21254–21262, 2020, doi: 10.1021/acsami.9b19921.
- [35] N. Fernandes, C. F. Rodrigues, A. F. Moreira, and I. J. Correia, “Overview of the application of inorganic nanomaterials in cancer photothermal therapy,” *Biomater Sci*, vol. 8, no. 11, pp. 2990–3020, 2020, doi: 10.1039/d0bm00222d.
- [36] H. Wang, X. Liang, J. Wang, S. Jiao, and D. Xue, “Multifunctional inorganic nanomaterials for energy applications,” *Nanoscale*, vol. 12, no. 1, pp. 14–42, 2020, doi: 10.1039/c9nr07008g.
- [37] J. Jeevanandam, A. Barhoum, Y. S. Chan, A. Dufresne, and M. K. Danquah, “Review on nanoparticles and nanostructured materials: History, sources, toxicity and regulations,” *Beilstein Journal of Nanotechnology*, vol. 9, no. 1, pp. 1050–1074, 2018, doi: 10.3762/bjnano.9.98.
- [38] R. Singla, S. M. S. Abidi, A. I. Dar, and A. Acharya, “Inhibition of glycation-induced aggregation of human serum albumin by organic-inorganic hybrid nanocomposites of iron oxide-functionalized nanocellulose,” *ACS Omega*, vol. 4, no. 12, pp. 14805–14819, Sep. 2019, doi: 10.1021/acsomega.9b01392.
- [39] G. Fumagalli *et al.*, “Cyclophamide-paclitaxel-containing nanoparticles: internalization in cells detected by confocal and super-resolution microscopy,” *Chempluschem*, vol. 80, no. 9, pp. 1380–1383, Sep. 2015, doi: 10.1002/cplu.201500156.

- [40] S. Borrelli *et al.*, “New class of squalene-based releasable nanoassemblies of paclitaxel, podophyllotoxin, camptothecin and epothilone A,” *Eur J Med Chem*, vol. 85, pp. 179–190, Oct. 2014, doi: 10.1016/j.ejmech.2014.07.035.
- [41] Y. Zhu, D. K. James, and J. M. Tour, “New routes to graphene, graphene oxide and their related applications,” *Advanced Materials*, vol. 24, no. 36, pp. 4924–4955, Sep. 18, 2012. doi: 10.1002/adma.201202321.
- [42] R. H. Baughman, A. A. Zakhidov, and W. A. de Heer, “Carbon nanotubes - The route toward applications,” *Science*, vol. 297, no. 5582, pp. 787–792, Aug. 02, 2002. doi: 10.1126/science.1060928.
- [43] A. M. Ealias and M. P. Saravanakumar, “A review on the classification, characterisation, synthesis of nanoparticles and their application,” in *IOP Conference Series: Materials Science and Engineering*, Dec. 2017, vol. 263, no. 3. doi: 10.1088/1757-899X/263/3/032019.
- [44] B. P. Dyett *et al.*, “Delivery of antimicrobial peptides to model membranes by cubosome nanocarriers,” *J Colloid Interface Sci*, vol. 600, pp. 14–22, Oct. 2021, doi: 10.1016/j.jcis.2021.03.161.
- [45] M. Verma, M. Chaudhary, A. Singh, N. Kaur, and N. Singh, “Naphthalimide-gold-based nanocomposite for the ratiometric detection of okadaic acid in shellfish,” *J Mater Chem B*, vol. 8, no. 36, pp. 8405–8413, Sep. 2020, doi: 10.1039/d0tb01195a.
- [46] A. Saini, M. Kaur, Mayank, A. Kuwar, N. Kaur, and N. Singh, “Hybrid nanoparticle based fluorescence switch for recognition of ketoprofen in aqueous media,” *Mol Syst Des Eng*, vol. 5, no. 8, pp. 1428–1436, Oct. 2020, doi: 10.1039/d0me00065e.
- [47] Y. Choi and S. Y. Lee, “Biosynthesis of inorganic nanomaterials using microbial cells and bacteriophages,” *Nature Reviews Chemistry*, vol. 4, no. 12. Nature Research, pp. 638–656, Dec. 01, 2020. doi: 10.1038/s41570-020-00221-w.
- [48] S. Bhardwaj, J. D. Sharma, S. Chand, K. K. Raina, and R. Kumar, “Enhanced electroactive phases in $\text{Bi}_{3.3}\text{La}_{0.7}\text{Ti}_3\text{O}_{12}$ -poly (vinylidene fluoride) composites with improved dielectric properties,” *Solid State Commun*, vol. 326, Mar. 2021, doi: 10.1016/j.ssc.2020.114176.

- [49] J. Singh, R. Kumar, V. Verma, and R. Kumar, "Comparative studies on optoelectronic properties of epitaxial $Mg_xCr_{2-x}O_3$ and $Al_xCr_{2-x}O_3$ ($x = 0, 0.1, 0.2$ and 0.3) thin films deposited on sapphire substrates," *J Alloys Compd*, vol. 847, Dec. 2020, doi: 10.1016/j.jallcom.2020.156371.
- [50] S. Iravani and R. S. Varma, "Bacteria in heavy metal remediation and nanoparticle biosynthesis," *ACS Sustainable Chemistry and Engineering*, vol. 8, no. 14, pp. 5395–5409, Apr. 13, 2020. doi: 10.1021/acssuschemeng.0c00292.
- [51] P. Calandra, V. la Parola, V. Turco Liveri, E. Lidorikis, and F. Finocchi, "Composite nanoparticles," *Journal of Chemistry*. 2013. doi: 10.1155/2013/536341.
- [52] K. Naim, S. T. Nair, P. Yadav, A. Shanavas, and P. P. Neelakandan, "Supramolecular confinement within chitosan nanocomposites enhances singlet oxygen generation," *Chempluschem*, vol. 83, no. 5, pp. 418–422, May 2018, doi: 10.1002/cplu.201800041.
- [53] P. P. P. Kumar, A. Rahman, T. Goswami, H. N. Ghosh, and P. P. Neelakandan, "Fine-tuning plasmon-molecule interactions in gold-BODIPY nanocomposites: the role of chemical structure and noncovalent interactions," *Chempluschem*, vol. 86, no. 1, pp. 87–94, Jan. 2021, doi: 10.1002/cplu.202000545.
- [54] M. Changez, V. Koul, and A. K. Dinda, "Efficacy of antibiotics-loaded interpenetrating network (IPNs) hydrogel based on poly(acrylic acid) and gelatin for treatment of experimental osteomyelitis: In vivo study," *Biomaterials*, vol. 26, no. 14, pp. 2095–2104, May 2005, doi: 10.1016/j.biomaterials.2004.06.008.
- [55] Sauraj, S. U. Kumar, V. Kumar, R. Priyadarshi, P. Gopinath, and Y. S. Negi, "pH-responsive prodrug nanoparticles based on xylan-curcumin conjugate for the efficient delivery of curcumin in cancer therapy," *Carbohydr Polym*, vol. 188, pp. 252–259, May 2018, doi: 10.1016/j.carbpol.2018.02.006.
- [56] G. Fumagalli *et al.*, "Hetero-Nanoparticles by self-assembly of ecdysteroid and doxorubi-cin conjugates as promising approach to overcome cancer resistance."
- [57] G. Valenti *et al.*, "Variable doping induces mechanism swapping in electrogenerated chemiluminescence of $Ru(bpy)_3^{2+}$ core-shell silica nanoparticles," *J Am Chem Soc*, vol. 138, no. 49, pp. 15935–15942, 2016, doi: 10.1021/jacs.6b08239.

- [58] I. Khan, K. Saeed, and I. Khan, "Nanoparticles: Properties, applications and toxicities," *Arabian Journal of Chemistry*, vol. 12, no. 7, pp. 908–931, 2019, doi: 10.1016/j.arabjc.2017.05.011.
- [59] X. Huang, F. Boey, and H. Zhang, "A brief review on graphene-nanoparticle composites," *Cosmos*, vol. 06, no. 02, pp. 159–166, 2010, doi: 10.1142/s0219607710000607.
- [60] M. F. De Volder, S. H. Tawfick, R. H. Baughman, and A. J. Hart, "Carbon nanotubes: present and future commercial applications," *Science (1979)*, vol. 339, no. 6119, pp. 535–539, 2013.
- [61] C. S. Sharma, H. Katepalli, A. Sharma, and M. Madou, "Fabrication and electrical conductivity of suspended carbon nanofiber arrays," *Carbon N Y*, vol. 49, no. 5, pp. 1727–1732, 2011, doi: 10.1016/j.carbon.2010.12.058.
- [62] O. G. Fawole, X. M. Cai, and A. R. Mackenzie, "Gas flaring and resultant air pollution: A review focusing on black carbon," *Environmental Pollution*, vol. 216, pp. 182–197, 2016, doi: 10.1016/j.envpol.2016.05.075.
- [63] M. Harshiny, C. N. Iswarya, and M. Matheswaran, "Biogenic synthesis of iron nanoparticles using *Amaranthus dubius* leaf extract as a reducing agent," *Powder Technol*, vol. 286, pp. 744–749, 2015, doi: 10.1016/j.powtec.2015.09.021.
- [64] B. Syed, NagendraM. N. Prasad, and S. Satisha, "Endogenic mediated synthesis of gold nanoparticles bearing bactericidal activity," *J Microsc Ultrastruct*, vol. 4, no. 3, p. 162, 2016, doi: 10.1016/j.jmau.2016.01.004.
- [65] V. M. Bau, X. Bo, and L. Guo, "Nitrogen-doped cobalt nanoparticles/nitrogen-doped plate-like ordered mesoporous carbons composites as noble-metal free electrocatalysts for oxygen reduction reaction," *Journal of Energy Chemistry*, vol. 26, no. 1, pp. 63–71, 2017, doi: 10.1016/j.jechem.2016.07.005.
- [66] J. Osuntokun and P. A. Ajibade, "Morphology and thermal studies of zinc sulfide and cadmium sulfide nanoparticles in polyvinyl alcohol matrix," *Physica B Condens Matter*, vol. 496, pp. 106–112, 2016, doi: 10.1016/j.physb.2016.05.024.

- [67] K. Tyszczyk-Rotko, I. Sadok, and M. Barczak, “Thiol-functionalized polysiloxanes modified by lead nanoparticles: Synthesis, characterization and application for determination of trace concentrations of mercury(II),” *Microporous and Mesoporous Materials*, vol. 230, pp. 109–117, 2016, doi: 10.1016/j.micromeso.2016.04.043.
- [68] C. H. Ryu, S. J. Joo, and H. S. Kim, “Two-step flash light sintering of copper nanoparticle ink to remove substrate warping,” *Appl Surf Sci*, vol. 384, pp. 182–191, 2016, doi: 10.1016/j.apsusc.2016.05.025.
- [69] K. Bogutska, Y. Sklyarov, and Y. Prylutsky, “Zinc and zinc nanoparticles: biological role and application in biomedicine,” *Ukrainica bioorganica acta*, vol. 1, pp. 9–16, 2013.
- [70] J. C. Hulteen, D. A. Treichel, M. T. Smith, M. L. Duval, T. R. Jensen, and R. P. Van Duyne, “Nanosphere lithography: Size-tunable silver nanoparticle and surface cluster arrays,” *Journal of Physical Chemistry B*, vol. 103, no. 19, pp. 3854–3863, 1999, doi: 10.1021/jp9904771.
- [71] Ü. H. Kaynar, I. Şabikoğlu, S. Ç. Kaynar, and M. Eral, “Modeling of thorium (IV) ions adsorption onto a novel adsorbent material silicon dioxide nano-balls using response surface methodology,” *Applied Radiation and Isotopes*, vol. 115, pp. 280–288, 2016, doi: 10.1016/j.apradiso.2016.06.033.
- [72] S. K. Bajpai, M. Jadaun, and S. Tiwari, “Synthesis, characterization and antimicrobial applications of zinc oxide nanoparticles loaded gum acacia/poly(SA) hydrogels,” *Carbohydr Polym*, vol. 153, pp. 60–65, 2016, doi: 10.1016/j.carbpol.2016.07.019.
- [73] S. J. Kim and B. H. Chung, “Antioxidant activity of levan coated cerium oxide nanoparticles,” *Carbohydr Polym*, vol. 150, pp. 400–407, 2016, doi: 10.1016/j.carbpol.2016.05.021.
- [74] M. T. Hurley *et al.*, “Synthesis, characterization, and application of antibody functionalized fluorescent silica nanoparticles,” *Adv Funct Mater*, vol. 23, no. 26, pp. 3335–3343, Jul. 2013, doi: 10.1002/adfm.201202699.
- [75] S. Jambhrunkar, S. Karmakar, A. Popat, M. Yu, and C. Yu, “Mesoporous silica nanoparticles enhance the cytotoxicity of curcumin,” *RSC Adv*, vol. 4, no. 2, pp. 709–712, 2014, doi: 10.1039/c3ra44257h.

- [76] S. Jambhrunkar *et al.*, “Effect of surface functionality of silica nanoparticles on cellular uptake and cytotoxicity,” *Mol Pharm*, vol. 11, no. 10, pp. 3642–3655, Oct. 2014, doi: 10.1021/mp500385n.
- [77] C. J. Cheng, G. T. Tietjen, J. K. Saucier-Sawyer, and W. M. Saltzman, “A holistic approach to targeting disease with polymeric nanoparticles,” *Nat Rev Drug Discov*, vol. 14, no. 4, pp. 239–247, 2015, doi: 10.1038/nrd4503.
- [78] X. Liu, Y. Yang, and M. W. Urban, “Stimuli-responsive polymeric nanoparticles,” *Macromol Rapid Commun*, vol. 38, no. 13, pp. 1–20, 2017, doi: 10.1002/marc.201700030.
- [79] A. Gagliardi *et al.*, “Biodegradable polymeric nanoparticles for drug delivery to solid tumors,” *Front Pharmacol*, vol. 12, no. February, pp. 1–24, 2021, doi: 10.3389/fphar.2021.601626.
- [80] S. Jain, V. v. Rathi, A. K. Jain, M. Das, and C. Godugu, “Folate-decorated PLGA nanoparticles as a rationally designed vehicle for the oral delivery of insulin,” *Nanomedicine*, vol. 7, no. 9, pp. 1311–1337, Sep. 2012, doi: 10.2217/nnm.12.31.
- [81] M. Kumar *et al.*, “Novel polymeric nanoparticles for intracellular delivery of peptide cargos: Antitumor efficacy of the BCL-2 conversion peptide NuBCP-9,” *Cancer Res*, vol. 74, no. 12, pp. 3271–3281, Jun. 2014, doi: 10.1158/0008-5472.CAN-13-2015.
- [82] S. v. Lale, A. Kumar, S. Prasad, A. C. Bharti, and V. Koul, “Folic acid and trastuzumab functionalized redox responsive polymersomes for intracellular doxorubicin delivery in breast cancer,” *Biomacromolecules*, vol. 16, no. 6, pp. 1736–1752, Jun. 2015, doi: 10.1021/acs.biomac.5b00244.
- [83] I. Meerovich, D. D. Smith, and A. K. Dash, “Direct solid-phase peptide synthesis on chitosan microparticles for targeting tumor cells,” *J Drug Deliv Sci Technol*, vol. 54, Dec. 2019, doi: 10.1016/j.jddst.2019.101288.
- [84] I. Meerovich, M. G. Nichols, and A. K. Dash, “Low-intensity light-induced paclitaxel release from lipid-based nano-delivery systems,” *J Drug Target*, vol. 27, no. 9, pp. 971–983, Oct. 2019, doi: 10.1080/1061186X.2019.1571066.

- [85] D. Bains, G. Singh, N. Kaur, and N. Singh, “Development of an ionic liquid@metal-based nanocomposite-loaded hierarchical hydrophobic surface to the aluminum substrate for antibacterial properties,” *ACS Appl Bio Mater*, vol. 3, no. 8, pp. 4962–4973, Aug. 2020, doi: 10.1021/acsabm.0c00492.
- [86] A. M. Ealias and M. P. Saravanakumar, “A review on the classification, characterisation, synthesis of nanoparticles and their application,” *IOP Conf Ser Mater Sci Eng*, vol. 263, no. 3, 2017, doi: 10.1088/1757-899X/263/3/032019.
- [87] A. A. Yaqoob *et al.*, “Recent advances in metal decorated nanomaterials and their various biological applications: a review,” *Front Chem*, vol. 8, no. May, pp. 1–23, 2020, doi: 10.3389/fchem.2020.00341.
- [88] A. A. Yaqoob, K. Umar, and M. N. M. Ibrahim, “Silver nanoparticles: various methods of synthesis, size affecting factors and their potential applications—a review,” *Applied Nanoscience (Switzerland)*, vol. 10, no. 5, pp. 1369–1378, 2020, doi: 10.1007/s13204-020-01318-w.
- [89] M. Das, D. Bandyopadhyay, R. P. Singh, H. Harde, S. Kumar, and S. Jain, “Orthogonal biofunctionalization of magnetic nanoparticles via ‘clickable’ poly(ethylene glycol) silanes: A ‘universal ligand’ strategy to design stealth and target-specific nanocarriers,” *J Mater Chem*, vol. 22, no. 47, pp. 24652–24667, Dec. 2012, doi: 10.1039/c2jm34571d.
- [90] P. G. Jamkhande, N. W. Ghule, A. H. Bamer, and M. G. Kalaskar, “Metal nanoparticles synthesis: An overview on methods of preparation, advantages and disadvantages, and applications,” *J Drug Deliv Sci Technol*, vol. 53, no. July, p. 101174, 2019, doi: 10.1016/j.jddst.2019.101174.
- [91] P. Majewski and B. Thierry, “Functionalized magnetite nanoparticles—synthesis, properties, and bio-applications,” *Critical Reviews in Solid State and Materials Sciences*, vol. 32, no. 3–4, pp. 203–215, Dec. 2007, doi: 10.1080/10408430701776680.
- [92] Z. Yang, D. Zhang, and D. Wang, “Carbon monoxide gas sensing properties of metal-organic frameworks-derived tin dioxide nanoparticles/molybdenum diselenide nanoflowers,” *Sens Actuators B Chem*, vol. 304, p. 127369, 2020, doi: 10.1016/j.snb.2019.127369.

- [93] G. Song *et al.*, “Carbon-coated FeCo nanoparticles as sensitive magnetic-particle-imaging tracers with photothermal and magnetothermal properties,” *Nat Biomed Eng*, vol. 4, no. 3, pp. 325–334, 2020, doi: 10.1038/s41551-019-0506-0.
- [94] Y. Xu *et al.*, “Targeted nanoparticles towards increased L cell stimulation as a strategy to improve oral peptide delivery in incretin-based diabetes treatment,” *Biomaterials*, vol. 255, p. 120209, 2020, doi: 10.1016/j.biomaterials.2020.120209.
- [95] V. Ahuja, S. Banerjee, P. Roy, and A. K. Bhatt, “Fluorescent xylitol carbon dots: A potent antimicrobial agent and drug carrier,” *Biotechnol Appl Biochem*, vol. n/a, no. n/a, Aug. 2021, doi: <https://doi.org/10.1002/bab.2237>.
- [96] M. Kumar *et al.*, “Intracellular delivery of peptide cargos using iron oxide based nanoparticles: Studies on antitumor efficacy of a BCL-2 converting peptide, NuBCP-9,” *Nanoscale*, vol. 6, no. 23, pp. 14473–14483, Dec. 2014, doi: 10.1039/c4nr04504a.
- [97] I. Meerovich, M. G. Nichols, and A. K. Dash, “Low-intensity light-induced drug release from a dual delivery system comprising of a drug loaded liposome and a photosensitive conjugate,” *J Drug Target*, vol. 28, no. 6, pp. 655–667, Jul. 2020, doi: 10.1080/1061186X.2019.1710838.
- [98] P. Demuth, M. Hurley, C. Wu, S. Galanie, M. R. Zachariah, and P. Deshong, “Mesoscale porous silica as drug delivery vehicles: Synthesis, characterization, and pH-sensitive release profiles,” *Microporous and Mesoporous Materials*, vol. 141, no. 1–3, pp. 128–134, May 2011, doi: 10.1016/j.micromeso.2010.10.035.
- [99] K. Shanmugaraj, A. S. Sharma, T. Sasikumar, R. V. Mangalaraja, and M. Ilanchelian, “Insight into the binding and conformational changes of hemoglobin/lysozyme with bimetallic alloy nanoparticles using various spectroscopic approaches,” *J Mol Liq*, vol. 300, p. 111747, 2020, doi: 10.1016/j.molliq.2019.111747.
- [100] M. Bilal and H. M. N. Iqbal, “New insights on unique features and role of nanostructured materials in cosmetics,” *Cosmetics*, vol. 7, no. 2, p. 24, 2020, doi: 10.3390/cosmetics7020024.

- [101] H. Y. Tang *et al.*, “Development, structure characterization and stability of food grade selenium nanoparticles stabilized by tilapia polypeptides,” *J Food Eng*, vol. 275, no. September 2019, p. 109878, 2020, doi: 10.1016/j.jfoodeng.2019.109878.
- [102] T. C. Coutinho, P. W. Tardioli, and C. S. Farinas, “Phytase immobilization on hydroxyapatite nanoparticles improves its properties for use in animal feed,” *Appl Biochem Biotechnol*, vol. 190, no. 1, pp. 270–292, 2020, doi: 10.1007/s12010-019-03116-9.
- [103] S. J. Tans, A. R. M. Verschueren, and C. Dekker, “Room-temperature transistor based on a single carbon nanotube,” *Nature*, vol. 393, no. 6680, pp. 49–52, 1998, doi: 10.1038/29954.
- [104] S. H. Ko *et al.*, “Direct nanoimprinting of metal nanoparticles for nanoscale electronics fabrication,” *Nano Lett*, vol. 7, no. 7, pp. 1869–1877, 2007, doi: 10.1021/nl070333v.
- [105] A.S. Arico, P. Bruce, B. Scrosati, J.M. Tarascon, and W. Van Schalkwijk, “Nanostructured materials for advanced energy conversion and storage devices,” *Materials for Sustainable Energy*, pp. 148–159, 2010, doi: 10.1007/978-3-662-56364-9_18.
- [106] W. C. W. Chan, D. J. Maxwell, X. Gao, R. E. Bailey, M. Han, and S. Nie, “Luminescent quantum dots for multiplexed biological detection and imaging,” *Curr Opin Biotechnol*, vol. 13, no. 1, pp. 40–46, 2002, doi: 10.1016/S0958-1669(02)00282-3.
- [107] K. Banerjee, S. Das, P. Choudhury, S. Ghosh, R. Baral, and S. K. Choudhuri, “A novel approach of synthesizing and evaluating the anticancer potential of silver oxide nanoparticles in vitro,” *Chemotherapy*, vol. 62, no. 5, pp. 279–289, 2017, doi: 10.1159/000453446.
- [108] S. Jain, D. G. Hirst, and J. M. O’Sullivan, “Gold nanoparticles as novel agents for cancer therapy,” *British Journal of Radiology*, vol. 85, no. 1010, pp. 101–113, 2012, doi: 10.1259/bjr/59448833.
- [109] M. B. Dowling *et al.*, “Multiphoton-absorption-induced-luminescence (MAIL) imaging of tumor-targeted gold nanoparticles,” *Bioconjug Chem*, vol. 21, no. 11, pp. 1968–1977, Nov. 2010, doi: 10.1021/bc100115m.

- [110] R. Qiao *et al.*, “Receptor-mediated delivery of magnetic nanoparticles across the blood-brain barrier,” *ACS Nano*, vol. 6, no. 4, pp. 3304–3310, 2012, doi: 10.1021/nn300240p.
- [111] Y. Wang, R. Hu, G. Lin, I. Roy, and K. T. Yong, “Functionalized quantum dots for biosensing and bioimaging and concerns on toxicity,” *ACS Appl Mater Interfaces*, vol. 5, no. 8, pp. 2786–2799, 2013, doi: 10.1021/am302030a.
- [112] A. Yadav, N. C. Verma, C. Rao, P. M. Mishra, A. Jaiswal, and C. K. Nandi, “Bovine serum albumin-conjugated red emissive gold nanocluster as a fluorescent nanoprobe for super-resolution microscopy,” *Journal of Physical Chemistry Letters*, vol. 11, no. 14, pp. 5741–5748, Jul. 2020, doi: 10.1021/acs.jpcclett.0c01354.
- [113] G. Ouyang, C. X. Wang, and G. W. Yang, “Surface energy of nanostructural materials with negative curvature and related size effects,” *Chem Rev*, vol. 109, no. 9, pp. 4221–4247, 2009, doi: 10.1021/cr900055f.
- [114] M. J. Ndolomingo, N. Bingwa, and R. Meijboom, “Review of supported metal nanoparticles: synthesis methodologies, advantages and application as catalysts,” *J Mater Sci*, vol. 55, no. 15, pp. 6195–6241, 2020, doi: 10.1007/s10853-020-04415-x.
- [115] B. Molleman and T. Hiemstra, “Size and shape dependency of the surface energy of metallic nanoparticles: Unifying the atomic and thermodynamic approaches,” *Physical Chemistry Chemical Physics*, vol. 20, no. 31, pp. 20575–20587, 2018, doi: 10.1039/c8cp02346h.
- [116] D. Vollath, F. D. Fischer, and D. Holec, “Surface energy of nanoparticles - influence of particle size and structure,” *Beilstein Journal of Nanotechnology*, vol. 9, no. 1, pp. 2265–2276, 2018, doi: 10.3762/bjnano.9.211.
- [117] L. Duan *et al.*, “Quantum dots for photovoltaics: a tale of two materials,” *Advanced Energy Materials*, vol. 11, no. 20, 2021. doi: 10.1002/aenm.202100354.
- [118] S. Y. Li and L. He, “Recent progresses of quantum confinement in graphene quantum dots,” *Frontiers of Physics*, vol. 17, no. 3, 2022. doi: 10.1007/s11467-021-1125-2.
- [119] S. Sahai, A. Ikram, S. Rai, R. Shrivastav, S. Dass, and V. R. Satsangi, “Quantum dots sensitization for photoelectrochemical generation of hydrogen: A review,” *Renewable*

- and Sustainable Energy Reviews*, vol. 68, pp. 19–27, 2017, doi: 10.1016/j.rser.2016.09.134.
- [120] J. Krajczewski, K. Kołataj, and A. Kudelski, “Plasmonic nanoparticles in chemical analysis,” *RSC Adv*, vol. 7, no. 28, pp. 17559–17576, 2017, doi: 10.1039/c7ra01034f.
- [121] J. Jana, M. Ganguly, and T. Pal, “Enlightening surface plasmon resonance effect of metal nanoparticles for practical spectroscopic application,” *RSC Adv*, vol. 6, no. 89, pp. 86174–86211, 2016, doi: 10.1039/c6ra14173k.
- [122] V. Polshettiwar and R. S. Varma, “Green chemistry by nano-catalysis,” *Green Chemistry*, vol. 12, no. 5, pp. 743–75, 2010, doi: 10.1039/b921171c.
- [123] J. Zhang, L. Mou, and X. Jiang, “Surface chemistry of gold nanoparticles for health-related applications,” *Chem Sci*, vol. 11, no. 4, pp. 923–936, 2020, doi: 10.1039/c9sc06497d.
- [124] A. Irshad, M. Zahid, T. Husnain, A. Q. Rao, N. Sarwar, and I. Hussain, “A proactive model on innovative biomedical applications of gold nanoparticles,” *Applied Nanoscience (Switzerland)*, vol. 10, no. 8, pp. 2453–2465, 2020, doi: 10.1007/s13204-019-01165-4.
- [125] S. A. Bansal, V. Kumar, J. Karimi, A. P. Singh, and S. Kumar, “Role of gold nanoparticles in advanced biomedical applications,” *Nanoscale Adv*, vol. 2, no. 9, pp. 3764–3787, 2020, doi: 10.1039/d0na00472c.
- [126] M. E. Piersimoni, X. Teng, A. E. G. Cass, and L. Ying, “Antioxidant lipoic acid ligand-shell gold nanoconjugates against oxidative stress caused by α -synuclein aggregates,” *Nanoscale Adv*, vol. 2, no. 12, pp. 5666–5681, Dec. 2020, doi: 10.1039/d0na00688b.
- [127] D. A. M.C. Daniel, “Gold nanoparticles: assembly, supramolecular chemistry, quantum-size-related properties, and applications toward,” *Chem. Rev.*, vol. 104, pp. 293–346, 2004.
- [128] X. Hu, Y. Zhang, T. Ding, J. Liu, and H. Zhao, “Multifunctional gold nanoparticles: a novel nanomaterial for various medical applications and biological activities,” *Front Bioeng Biotechnol*, vol. 8, no. August, pp. 1–17, 2020, doi: 10.3389/fbioe.2020.00990.

- [129] V. Ramalingam, “Multifunctionality of gold nanoparticles: Plausible and convincing properties,” *Adv Colloid Interface Sci*, vol. 271, p. 101989, 2019, doi: 10.1016/j.cis.2019.101989.
- [130] D. Sharma and A. Chaudhary, “One pot synthesis of gentamicin conjugated gold nanoparticles as an efficient antibacterial agent,” *J Clust Sci*, 2020, doi: 10.1007/s10876-020-01864-x.
- [131] F. Naz, V. Koul, A. Srivastava, Y. K. Gupta, and A. K. Dinda, “Biokinetics of ultrafine gold nanoparticles (AuNPs) relating to redistribution and urinary excretion: A long-term in vivo study,” *J Drug Target*, vol. 24, no. 8, pp. 720–729, Sep. 2016, doi: 10.3109/1061186X.2016.1144758.
- [132] A. Phongphut *et al.*, “Clay/au nanoparticle composites as acetylcholinesterase carriers and modified-electrode materials: A comparative study,” *Appl Clay Sci*, vol. 194, Sep. 2020, doi: 10.1016/j.clay.2020.105704.
- [133] A. K. Khan, R. Rashid, G. Murtaza, and A. Zahra, “Gold nanoparticles: Synthesis and applications in drug delivery,” *Tropical Journal of Pharmaceutical Research*, vol. 13, no. 7, pp. 1169–1177, 2014, doi: 10.4314/tjpr.v13i7.23.
- [134] N. Sarfraz and I. Khan, “Plasmonic gold nanoparticles (AuNPs): properties, synthesis and their advanced energy, environmental and biomedical applications,” *Chem Asian J*, vol. 16, no. 7, pp. 720–742, 2021, doi: 10.1002/asia.202001202.
- [135] X. Yang, M. Yang, B. Pang, M. Vara, and Y. Xia, “Gold nanomaterials at work in biomedicine,” *Chem Rev*, vol. 115, no. 19, pp. 10410–10488, 2015, doi: 10.1021/acs.chemrev.5b00193.
- [136] W. Li and X. Chen, “Gold nanoparticles for photoacoustic imaging,” *Nanomedicine*, vol. 10, no. 2, pp. 299–320, 2015, doi: 10.2217/nnm.14.169.
- [137] H. Li *et al.*, “Advances in the application of gold nanoparticles in bone tissue engineering,” *J Biol Eng*, vol. 14, no. 1, pp. 1–15, 2020, doi: 10.1186/s13036-020-00236-3.
- [138] V. B. Borse, A. N. Konwar, R. D. Jayant, and P. O. Patil, “Perspectives of characterization and bioconjugation of gold nanoparticles and their application in lateral

- flow immunosensing,” *Drug Deliv Transl Res*, vol. 10, no. 4, pp. 878–902, 2020, doi: 10.1007/s13346-020-00771-y.
- [139] E. Y. Kim, D. Kumar, G. Khang, and D. K. Lim, “Recent advances in gold nanoparticle-based bioengineering applications,” *J Mater Chem B*, vol. 3, no. 43, pp. 8433–8444, 2015, doi: 10.1039/c5tb01292a.
- [140] C. Tortolini, A. E. G. Cass, R. Pofi, A. Lenzi, and R. Antiochia, “Microneedle-based nanoporous gold electrochemical sensor for real-time catecholamine detection,” *Microchimica Acta*, vol. 189, no. 5, p. 180, May 2022, doi: 10.1007/s00604-022-05260-2.
- [141] E. C. Dreaden, A. M. Alkilany, X. Huang, C. J. Murphy, and M. A. El-Sayed, “The golden age: Gold nanoparticles for biomedicine,” *Chem Soc Rev*, vol. 41, no. 7, pp. 2740–2779, 2012, doi: 10.1039/c1cs15237h.
- [142] S. J. Yu, Y. G. Yin, and J. F. Liu, “Silver nanoparticles in the environment,” *Environmental Sciences: Processes and Impacts*, vol. 15, no. 1, pp. 78–92, 2013, doi: 10.1039/c2em30595j.
- [143] H. J. Klasen, “A historical review of the use of silver in the treatment of burns. II. Renewed interest for silver,” *Burns*, vol. 26, no. 2, pp. 131–138, 2000, doi: 10.1016/S0305-4179(99)00116-3.
- [144] A. D. Russell and W. B. Hugo, “Antimicrobial Activity and Action of Silver,” *Prog Med Chem*, vol. 31, no. C, pp. 351–370, 1994, doi: 10.1016/S0079-6468(08)70024-9.
- [145] K. HJ., “Historical review of the use of silver in the treatment of burns.I. Early uses,” *Burns*, vol. 26, pp. 117–130, 2000.
- [146] M. C. Lea, “Allotropic forms of silver,” *Am J Sci*, vol. 37, pp. 476–491, 1889, doi: <https://doi.org/10.2475/ajs.s3-37.222.476>.
- [147] M. C. Fung and D. L. Bowen, “Silver Products for Medical Indications: Risk-Benefit Assessment,” *Journal of toxicology: Clinical toxicology*, vol. 34, pp. 119-126, 1996.

- [148] N. R. Chowdhury, M. MacGregor-Ramiasa, P. Zilm, P. Majewski, and K. Vasilev, “‘Chocolate’ silver nanoparticles: Synthesis, antibacterial activity and cytotoxicity,” *J Colloid Interface Sci*, vol. 482, pp. 151–158, Nov. 2016, doi: 10.1016/j.jcis.2016.08.003.
- [149] W. R. Li, X. B. Xie, Q. S. Shi, S. S. Duan, Y. S. Ouyang, and Y. Ben Chen, “Antibacterial effect of silver nanoparticles on *Staphylococcus aureus*,” *BioMetals*, vol. 24, no. 1, pp. 135–141, 2011, doi: 10.1007/s10534-010-9381-6.
- [150] S. S. Birla, V. V. Tiwari, A. K. Gade, A. P. Ingle, A. P. Yadav, and M. K. Rai, “Fabrication of silver nanoparticles by *Phoma glomerata* and its combined effect against *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*,” *Lett Appl Microbiol*, vol. 48, no. 2, pp. 173–179, 2009, doi: 10.1111/j.1472-765X.2008.02510.x.
- [151] H. H. Lara, N. V. Ayala-Núñez, L. C. I. del Turrent, and C. R. Padilla, “Bactericidal effect of silver nanoparticles against multidrug-resistant bacteria,” *World J Microbiol Biotechnol*, vol. 26, no. 4, pp. 615–621, 2010, doi: 10.1007/s11274-009-0211-3.
- [152] H. D. Beyene, A. A. Werkneh, H. K. Bezabh, and T. G. Ambaye, “Synthesis paradigm and applications of silver nanoparticles (AgNPs), a review,” *Sustainable Materials and Technologies*, vol. 13, pp. 18–23, 2017, doi: 10.1016/j.susmat.2017.08.001.
- [153] H. M. M. Ibrahim, “Green synthesis and characterization of silver nanoparticles using banana peel extract and their antimicrobial activity against representative microorganisms,” *J Radiat Res Appl Sci*, vol. 8, pp. 265–275, 2015, doi: 10.1016/j.jrras.2015.01.007.
- [154] H. M. Gong, L. Zhou, X. R. Su, S. Xiao, S. D. Liu, and Q. Q. Wang, “Illuminating dark plasmons of silver nanoantenna rings to enhance exciton-plasmon interactions,” *Adv Funct Mater*, vol. 19, no. 2, pp. 298–303, 2009, doi: 10.1002/adfm.200801151.
- [155] Y. A. Krutyakov, A. A. Kudrinskiy, A. Y. Olenin, and G. V. Lisichkin, “Synthesis and properties of silver nanoparticles: advances and prospects,” *Russian Chemical Reviews*, vol. 77, no. 3, pp. 233–257, 2008, doi: 10.1070/rc2008v077n03abeh003751.
- [156] X. F. Zhang, Z. G. Liu, W. Shen, and S. Gurunathan, “Silver nanoparticles: Synthesis, characterization, properties, applications, and therapeutic approaches,” *Int J Mol Sci*, vol. 17, no. 9, 2016, doi: 10.3390/ijms17091534.

- [157] A. A. Alswat, M. Bin Ahmad, T. A. Saleh, M. Z. Bin Hussein, and N. A. Ibrahim, "Effect of zinc oxide amounts on the properties and antibacterial activities of zeolite/zinc oxide nanocomposite," *Materials Science and Engineering C*, vol. 68, pp. 505–511, 2016, doi: 10.1016/j.msec.2016.06.028.
- [158] A. A. Alswat, M. Bin Ahmad, M. Z. Hussein, N. A. Ibrahim, and T. A. Saleh, "Copper oxide nanoparticles-loaded zeolite and its characteristics and antibacterial activities," *J Mater Sci Technol*, vol. 33, no. 8, pp. 889–896, 2017, doi: 10.1016/j.jmst.2017.03.015.
- [159] E. Kotb, A. A. Ahmed, T. A. Saleh, A. M. Ajeebi, M. S. Al-Gharsan, and N. F. Aldahmash, "Pseudobactins bounded iron nanoparticles for control of an antibiotic-resistant *Pseudomonas aeruginosa* ryn32," *Biotechnol Prog*, vol. 36, no. 1, pp. 1–8, 2020, doi: 10.1002/btpr.2907.
- [160] Y. Ohara *et al.*, "Seed-mediated gold nanoparticle synthesis via photochemical reaction of benzoquinone," *Colloids Surf A Physicochem Eng Asp*, vol. 586, p. 124209, 2020, doi: 10.1016/j.colsurfa.2019.124209.
- [161] T. Zahra and K. S. Ahmad, "Structural, optical and electrochemical studies of organo-templated wet synthesis of cubic shaped nickel oxide nanoparticles," *Optik (Stuttg)*, vol. 205, no. January, p. 164241, 2020, doi: 10.1016/j.ijleo.2020.164241.
- [162] A. A. Zezin, D. I. Klimov, E. A. Zezina, K. V. Mkrtchyan, and V. I. Feldman, "Controlled radiation-chemical synthesis of metal polymer nanocomposites in the films of interpolyelectrolyte complexes: Principles, prospects and implications," *Radiation Physics and Chemistry*, vol. 169, 2020, doi: 10.1016/j.radphyschem.2018.11.030.
- [163] R. Riedel, N. Mahr, C. Yao, A. Wu, F. Yang, and N. Hampp, "Synthesis of gold-silica core-shell nanoparticles by pulsed laser ablation in liquid and their physico-chemical properties towards photothermal cancer therapy," *Nanoscale*, vol. 12, no. 5, pp. 3007–3018, 2020, doi: 10.1039/c9nr07129f.
- [164] A. Ahmeda, A. Zangeneh, and M. M. Zangeneh, "Green synthesis and chemical characterization of gold nanoparticle synthesized using *Camellia sinensis* leaf aqueous extract for the treatment of acute myeloid leukemia in comparison to daunorubicin in a leukemic mouse model," *Appl Organomet Chem*, vol. 34, no. 3, pp. 1–13, 2020, doi: 10.1002/aoc.5290.

- [165] K. B. Narayanan and N. Sakthivel, "Biological synthesis of metal nanoparticles by microbes," *Adv Colloid Interface Sci*, vol. 156, no. 1–2, pp. 1–13, 2010, doi: 10.1016/j.cis.2010.02.001.
- [166] M. F. Al-Hakkani, "Biogenic copper nanoparticles and their applications: A review," *SN Appl Sci*, vol. 2, no. 3, 2020, doi: 10.1007/s42452-020-2279-1.
- [167] A. Tamilvanan, K. Balamurugan, K. Ponappa, and B. M. Kumar, "Copper nanoparticles: Synthetic strategies, properties and multifunctional application," *Int J Nanosci*, vol. 13, no. 2, 2014, doi: 10.1142/S0219581X14300016.
- [168] N. R. Jana, L. Gearheart, and C. J. Murphy, "Evidence for seed-mediated nucleation in the chemical reduction of gold salts to gold nanoparticles," *Chemistry of Materials*, vol. 13, no. 7, pp. 2313–2322, 2001, doi: 10.1021/cm000662n.
- [169] M. I. Din and R. Rehan, "Synthesis, characterization, and applications of copper nanoparticles," *Anal Lett*, vol. 50, no. 1, pp. 50–62, 2017, doi: 10.1080/00032719.2016.1172081.
- [170] T. M. Tolaymat, A. M. El Badawy, A. Genaidy, K. G. Scheckel, T. P. Luxton, and M. Suidan, "An evidence-based environmental perspective of manufactured silver nanoparticle in syntheses and applications: A systematic review and critical appraisal of peer-reviewed scientific papers," *Science of the Total Environment*, vol. 408, no. 5, pp. 999–1006, 2010, doi: 10.1016/j.scitotenv.2009.11.003.
- [171] J. Meija *et al.*, "Atomic weights of the elements 2013 (IUPAC Technical Report)," *Pure and Applied Chemistry*, vol. 88, no. 3, pp. 265–291, 2016, doi: 10.1515/pac-2015-0305.
- [172] D. Pedone, M. Moglianetti, E. De Luca, G. Bardi, and P. P. Pompa, "Platinum nanoparticles in nanobiomedicine," *Chem Soc Rev*, vol. 46, no. 16, pp. 4951–4975, 2017, doi: 10.1039/c7cs00152e.
- [173] C. K. Tsung *et al.*, "Sub-10 nm Platinum nanocrystals with size and shape control: Catalytic study for Ethylene and pyrrole hydrogenation," *J Am Chem Soc*, vol. 131, no. 16, pp. 5816–5822, 2009, doi: 10.1021/ja809936n.

- [174] M. Miyake and K. Miyabayashi, "Shape and size controlled Pt nanocrystals as novel model catalysts," *Catalysis Surveys from Asia*, vol. 16, no. 1, pp. 1–13, 2012, doi: 10.1007/s10563-011-9128-6.
- [175] A. T. Madsen, E. H. Ahmed, C. H. Christensen, R. Fehrmann, and A. Riisager, "Hydrodeoxygenation of waste fat for diesel production: Study on model feed with Pt/alumina catalyst," *Fuel*, vol. 90, no. 11, pp. 3433–3438, 2011, doi: 10.1016/j.fuel.2011.06.005.
- [176] M. Jeyaraj, S. Gurunathan, M. Qasim, M. H. Kang, and J. H. Kim, "A comprehensive review on the synthesis, characterization, and biomedical application of platinum nanoparticles," *Nanomaterials*, vol. 9, no. 12, 2019, doi: 10.3390/nano9121719.
- [177] M. Huang *et al.*, "Active site-directed tandem catalysis on single platinum nanoparticles for efficient and stable oxidation of formaldehyde at room temperature," *Environ Sci Technol*, vol. 53, no. 7, pp. 3610–3619, 2019, doi: 10.1021/acs.est.9b01176.
- [178] S. Das, A. K. Biswal, K. Parida, R. N. P. Choudhary, and A. Roy, "Electrical and mechanical behavior of PMN-PT/CNT based polymer composite film for energy harvesting," *Appl Surf Sci*, vol. 428, pp. 356–363, 2018, doi: 10.1016/j.apsusc.2017.09.077.
- [179] R. H. Gadah and A. S. Basaleh, "Influence of doped platinum nanoparticles on photocatalytic performance of CuO–SiO₂ for degradation of Acridine orange dye," *Ceram Int*, vol. 46, no. 2, pp. 1690–1696, 2020, doi: 10.1016/j.ceramint.2019.09.141.
- [180] Z. Peng and H. Yang, "Designer platinum nanoparticles: Control of shape, composition in alloy, nanostructure and electrocatalytic property," *Nano Today*, vol. 4, no. 2, pp. 143–164, 2009, doi: 10.1016/j.nantod.2008.10.010.
- [181] G. C. Bond, "The electronic structure of platinum-gold alloy particles: Better catalysts for selective oxidations," *Platin Met Rev*, vol. 51, no. 2, pp. 63–68, 2007, doi: 10.1595/147106707X187353.
- [182] P. Puja and P. Kumar, "A perspective on biogenic synthesis of platinum nanoparticles and their biomedical applications," *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 211, pp. 94–99, 2019, doi: 10.1016/j.saa.2018.11.047.

- [183] P. T. Craddock, “The composition of the copper alloys used by the Greek, etruscan and Roman civilisations. 2. The Archaic, Classical and Hellenistic Greeks,” *J Archaeol Sci*, vol. 4, no. 2, pp. 103–123, 1977, doi: 10.1016/0305-4403(77)90058-9.
- [184] H. R. Hanley, “The story of zinc. IV,” *J Chem Educ*, pp. 111–113, 1934, doi: 10.1021/ed011p111.
- [185] A. K. Barui, R. Kotcherlakota, and C. R. Patra, *Biomedical applications of zinc oxide nanoparticles*. Elsevier Inc., 2018. doi: 10.1016/B978-0-12-813661-4.00006-7.
- [186] C. J. Frederickson, J. Y. Koh, and A. I. Bush, “The neurobiology of zinc in health and disease,” *Nat Rev Neurosci*, vol. 6, no. 6, pp. 449–462, 2005, doi: 10.1038/nrn1671.
- [187] W. H. Pories, W.J. Henzel, J.H. Rob, C.G. and Strain, “Acceleration of healing with zinc sulfate.” pp. 432–436, 1967. doi: <https://dx.doi.org/10.1097%2F00000658-196703000-00015>.
- [188] M. Gupta, V. K. Mahajan, K. S. Mehta, and P. S. Chauhan, “Zinc therapy in dermatology: A review,” *Dermatol Res Pract*, vol. 2014, 2014, doi: 10.1155/2014/709152.
- [189] A. Moezzi, A. M. McDonagh, and M. B. Cortie, “Zinc oxide particles: Synthesis, properties and applications,” *Chemical Engineering Journal*, vol. 185–186, pp. 1–22, 2012, doi: 10.1016/j.cej.2012.01.076.
- [190] J. E. Rodríguez-Paéz, A. C. Caballero, M. Villegas, C. Moure, P. Durán, and J. F. Fernández, “Controlled precipitation methods: Formation mechanism of ZnO nanoparticles,” *Journal of the European Ceramic Society*, vol. 21, no. 7. pp. 925–930, 2001. doi: 10.1016/S0955-2219(00)00283-1.
- [191] B. Abebe, E. A. Zereffa, A. Tadesse, and H. C. A. Murthy, “A review on enhancing the antibacterial activity of ZnO: Mechanisms and microscopic investigation,” *Nanoscale Res Lett*, vol. 15, no. 1, 2020, doi: 10.1186/s11671-020-03418-6.
- [192] D. Sharma, J. Rajput, B. S. Kaith, M. Kaur, and S. Sharma, “Synthesis of ZnO nanoparticles and study of their antibacterial and antifungal properties,” in *Thin Solid Films*, Nov. 2010, vol. 519, no. 3, pp. 1224–1229. doi: 10.1016/j.tsf.2010.08.073.

- [193] A. M. Wagner, J. M. Knipe, G. Orive, and N. A. Peppas, “Quantum dots in biomedical applications,” *Acta Biomaterialia*, vol. 94. Acta Materialia Inc, pp. 44–63, Aug. 01, 2019. doi: 10.1016/j.actbio.2019.05.022.
- [194] N. Azam, M. Najabat Ali, and T. Javaid Khan, “Carbon quantum dots for biomedical applications: review and analysis,” *Frontiers in Materials*, vol. 8. Frontiers Media S.A., Aug. 24, 2021. doi: 10.3389/fmats.2021.700403.
- [195] X. He and N. Ma, “An overview of recent advances in quantum dots for biomedical applications,” *Colloids Surf B Biointerfaces*, vol. 124, pp. 118–131, Dec. 2014, doi: 10.1016/j.colsurfb.2014.06.002.
- [196] P. Namdari, B. Negahdari, and A. Eatemadi, “Synthesis, properties and biomedical applications of carbon-based quantum dots: An updated review,” *Biomedicine and Pharmacotherapy*, vol. 87. Elsevier Masson SAS, pp. 209–222, Mar. 01, 2017. doi: 10.1016/j.biopha.2016.12.108.
- [197] U. Resch-Genger, M. Grabolle, S. Cavaliere-Jaricot, R. Nitschke, and T. Nann, “Quantum dots versus organic dyes as fluorescent labels,” *Nature Methods*, vol. 5, no. 9. pp. 763–775, 2008. doi: 10.1038/nmeth.1248.
- [198] D. Sharma, S. S. Gulati, N. Sharma, and A. Chaudhary, “Sustainable synthesis of silver nanoparticles using various biological sources and waste materials: a review,” *Emergent Mater*, 2021, doi: 10.1007/s42247-021-00292-5.
- [199] M. A. Meyers, A. Mishra, and D. J. Benson, “Mechanical properties of nanocrystalline materials,” *Prog Mater Sci*, vol. 51, no. 4, pp. 427–556, May 2006, doi: 10.1016/J.PMATSCI.2005.08.003.
- [200] T. Prasad Yadav, R. Manohar Yadav, and D. Pratap Singh, “Mechanical milling: a top down approach for the synthesis of nanomaterials and nanocomposites,” *Nanoscience and Nanotechnology*, vol. 2, no. 3, pp. 22–48, 2012, doi: 10.5923/j.nn.20120203.01.
- [201] M. Ullah, M. E. Ali, and S. B. A. Hamid, “Surfactant-assisted ball milling: A novel route to novel materials with controlled nanostructure-A review,” *Reviews on Advanced Materials Science*, vol. 37, no. 1–2, pp. 1–14, 2014.

- [202] M. Mehrabi, P. Parvin, A. Reyhani, and S. Z. Mortazavi, “Hybrid laser ablation and chemical reduction to synthesize Ni/Pd nanoparticles decorated multi-wall carbon nanotubes for effective enhancement of hydrogen storage,” *Int J Hydrogen Energy*, vol. 43, no. 27, pp. 12211–12221, Jul. 2018, doi: 10.1016/J.IJHYDENE.2018.04.144.
- [203] J. Zhang, M. Chaker, and D. Ma, “Pulsed laser ablation based synthesis of colloidal metal nanoparticles for catalytic applications,” *J Colloid Interface Sci*, vol. 489, pp. 138–149, Mar. 2017, doi: 10.1016/J.JCIS.2016.07.050.
- [204] S. A. Davari, J. L. Gottfried, C. Liu, E. L. Ribeiro, G. Duscher, and D. Mukherjee, “Graphitic coated Al nanoparticles manufactured as superior energetic materials via laser ablation synthesis in organic solvents,” *Appl Surf Sci*, vol. 473, pp. 156–163, Apr. 2019, doi: 10.1016/J.APSUSC.2018.11.238.
- [205] R. Rawat, A. Tiwari, V. S. Vendamani, A. P. Pathak, S. V. Rao, and A. Tripathi, “Synthesis of Si/SiO₂ nanoparticles using nanosecond laser ablation of silicate-rich garnet in water,” *Opt Mater (Amst)*, vol. 75, pp. 350–356, Jan. 2018, doi: 10.1016/J.OPTMAT.2017.10.045.
- [206] C. Gatzen, D. E. Mack, O. Guillon, and R. Vaßen, “Improved adhesion of different environmental barrier coatings on Al₂O₃/Al₂O₃-ceramic matrix composites,” *Adv Eng Mater*, vol. 22, no. 6, 2020, doi: 10.1002/adem.202000087.
- [207] E. M. Sebastian, S. Kumar, R. Purohit, S. K. Dhakad, and R. S. Rana, “Materials Today : Proceedings nanolithography and its current advancements,” *Mater Today Proc*, no. xxxx, 2020, doi: 10.1016/j.matpr.2020.02.505.
- [208] R. K. Singh and R. Sharma, “Techniques used for mask less lithography,” *International Journal of Science and Research (IJSR)*, vol. 2, no. 7, pp. 135–138, 2013.
- [209] P. Colson, C. Henrist, and R. Cloots, “Nanosphere lithography: A powerful method for the controlled manufacturing of nanomaterials,” *Journal of Nanomaterials*, vol. 2013, 2013. doi: 10.1155/2013/948510.
- [210] H. Meyer, M. Meischein, and A. Ludwig, “Rapid assessment of sputtered nanoparticle ionic liquid combinations,” *ACS Comb Sci*, vol. 20, no. 4, pp. 243–250, 2018, doi: 10.1021/acscombsci.8b00017.

- [211] M. Nie, K. Sun, and D. D. Meng, “Formation of metal nanoparticles by short-distance sputter deposition in a reactive ion etching chamber,” *J Appl Phys*, vol. 106, no. 5, 2009, doi: 10.1063/1.3211326.
- [212] T. A. Saleh, “Protocols for synthesis of nanomaterials, polymers, and green materials as adsorbents for water treatment technologies,” *Environ Technol Innov*, vol. 24, p. 101821, 2021, doi: 10.1016/j.eti.2021.101821.
- [213] Q. Zhu *et al.*, *Bottom-Up Engineering Strategies for High-Performance Thermoelectric Materials*, vol. 13, no. 1. Springer Singapore, 2021. doi: 10.1007/s40820-021-00637-z.
- [214] M. Parashar, V. K. Shukla, and R. Singh, “Metal oxides nanoparticles via sol–gel method: a review on synthesis, characterization and applications,” *Journal of Materials Science: Materials in Electronics*, vol. 31, no. 5, pp. 3729–3749, 2020, doi: 10.1007/s10854-020-02994-8.
- [215] D. P. Debecker, “Innovative sol-gel routes for the bottom-up preparation of heterogeneous catalysts,” *Chemical Record*, vol. 18, no. 7, pp. 662–675, 2018, doi: 10.1002/tcr.201700068.
- [216] A. R. Liu, S. M. Wang, Y. R. Zhao, and Z. Zheng, “Low-temperature preparation of nanocrystalline TiO₂ photocatalyst with a very large specific surface area,” *Mater Chem Phys*, vol. 99, no. 1, pp. 131–134, 2006, doi: 10.1016/j.matchemphys.2005.10.003.
- [217] S. G. Kumar and K. S. R. K. Rao, “Polymorphic phase transition among the titania crystal structures using a solution-based approach: From precursor chemistry to nucleation process,” *Nanoscale*, vol. 6, no. 20, pp. 11574–11632, 2014, doi: 10.1039/c4nr01657b.
- [218] G. Vilaridi, M. Stoller, L. Di Palma, K. Boodhoo, and N. Verdone, “Metallic iron nanoparticles intensified production by spinning disk reactor: Optimization and fluid dynamics modelling,” *Chemical Engineering and Processing - Process Intensification*, vol. 146, p. 107683, 2019, doi: 10.1016/j.cep.2019.107683.
- [219] M. Stoller and J. M. Ochando-Pulido, “ZnO nano-particles production intensification by means of a spinning disk reactor,” *Nanomaterials*, vol. 10, no. 7, pp. 1–15, 2020, doi: 10.3390/nano10071321.

- [220] A. N. Manzano Martínez, A. Chaudhuri, M. Besten, M. Assirelli, and J. van der Schaaf, “Micromixing efficiency in the presence of an inert gas in a rotor-stator spinning disk reactor,” *Ind Eng Chem Res*, vol. 60, no. 24, pp. 8677–8686, 2021, doi: 10.1021/acs.iecr.1c01238.
- [221] S. Sana, V. Zivkovic, and K. Boodhoo, “Empirical modelling of hydrodynamic effects on starch nanoparticles precipitation in a spinning disc reactor,” *Nanomaterials*, vol. 10, no. 11, pp. 1–16, 2020, doi: 10.3390/nano10112202.
- [222] M. N. Mujawar *et al.*, “Advanced nanomaterials synthesis from pyrolysis and hydrothermal carbonization: A review,” *Curr Org Chem*, vol. 21, pp. 446–461, 2017, doi: 10.2174/1385272821666171026153215.
- [223] S. E. Pratsinis, O. Arabi-Katbi, C. M. Megaridis, P. W. Morrison, S. Tsantilis, and H. K. Kammler, “Flame synthesis of spherical nanoparticles,” *Materials Science Forum*, vol. 343, pp. 583–596, 2000, doi: 10.4028/www.scientific.net/msf.343-346.511.
- [224] R. D’Amato *et al.*, “Synthesis of ceramic nanoparticles by laser pyrolysis: From research to applications,” *J Anal Appl Pyrolysis*, vol. 104, pp. 461–469, 2013, doi: 10.1016/j.jaap.2013.05.026.
- [225] I. Ijaz, E. Gilani, A. Nazir, and A. Bukhari, “Detail review on chemical, physical and green synthesis, classification, characterizations and applications of nanoparticles,” *Green Chem Lett Rev*, vol. 13, no. 3, pp. 59–81, 2020, doi: 10.1080/17518253.2020.1802517.
- [226] R. Strobel and S. E. Pratsinis, “Direct synthesis of maghemite, magnetite and wustite nanoparticles by flame spray pyrolysis,” *Advanced Powder Technology*, vol. 20, no. 2, pp. 190–194, 2009, doi: 10.1016/j.appt.2008.08.002.
- [227] C. Xu *et al.*, “Facile synthesis of effective Ru nanoparticles on carbon by adsorption-low temperature pyrolysis strategy for hydrogen evolution,” *J Mater Chem A Mater*, vol. 6, no. 29, pp. 14380–14386, 2018, doi: 10.1039/c8ta03572e.
- [228] S. M. Lee, K. C. Song, and B. S. Lee, “Antibacterial activity of silver nanoparticles prepared by a chemical reduction method,” *Korean Journal of Chemical Engineering*, vol. 27, no. 2, pp. 688–692, 2010, doi: 10.1007/s11814-010-0067-0.

- [229] M. Brust and C. J. Kiely, "Some recent advances in nanostructure preparation from gold and silver particles: A short topical review," *Colloids Surf A Physicochem Eng Asp*, vol. 202, no. 2–3, pp. 175–186, 2002, doi: 10.1016/S0927-7757(01)01087-1.
- [230] S. Iravani, H. Korbekandi, S. V. Mirmohammadi, and B. Zolfaghari, "Synthesis of silver nanoparticles: Chemical, physical and biological methods," *Res Pharm Sci*, vol. 9, no. 6, pp. 385–406, 2014.
- [231] M. Kamran, M. Haroon, S. A. Popoola, A. R. Almohammed, A. A. Al-Saadi, and T. A. Saleh, "Characterization of valeric acid using substrate of silver nanoparticles with SERS," *J Mol Liq*, vol. 273, pp. 536–542, 2019, doi: 10.1016/j.molliq.2018.10.037.
- [232] T. A. Saleh, M. M. Al-Shalalfeh, and A. A. Al-Saadi, "Silver nanoparticles for detection of methimazole by surface-enhanced Raman spectroscopy," *Mater Res Bull*, vol. 91, pp. 173–178, 2017, doi: 10.1016/j.materresbull.2017.03.041.
- [233] T. A. Saleh, M. M. Al-Shalalfeh, and A. A. Al-Saadi, "Silver loaded graphene as a substrate for sensing 2-thiouracil using surface-enhanced Raman scattering," *Sens Actuators B Chem*, vol. 254, pp. 1110–1117, 2018, doi: 10.1016/j.snb.2017.07.179.
- [234] P. Mendis, R. M. De Silva, K. M. N. De Silva, L. A. Wijenayaka, K. Jayawardana, and M. Yan, "Nanosilver rainbow: A rapid and facile method to tune different colours of nanosilver through the controlled synthesis of stable spherical silver nanoparticles," *RSC Adv*, vol. 6, no. 54, pp. 48792–48799, 2016, doi: 10.1039/c6ra08336f.
- [235] G. I. Mantanis, C. Lykidis, and A. N. Papadopoulos, "Durability of accoya wood in ground stake testing after 10 years of exposure in Greece," *Polymers (Basel)*, vol. 12, no. 8, 2020, doi: 10.3390/POLYM12081635.
- [236] P. Proposito *et al.*, "Bifunctionalized silver nanoparticles as Hg²⁺ plasmonic sensor in water: Synthesis, characterizations, and ecosafety," *Nanomaterials*, vol. 9, no. 10, 2019, doi: 10.3390/nano9101353.
- [237] X. L. Cao, C. Cheng, Y. L. Ma, and C. S. Zhao, "Preparation of silver nanoparticles with antimicrobial activities and the researches of their biocompatibilities," *J Mater Sci Mater Med*, vol. 21, no. 10, pp. 2861–2868, 2010, doi: 10.1007/s10856-010-4133-2.

- [238] I. Schiesaro *et al.*, “Hydrophilic silver nanoparticles for Hg(II) detection in water: direct evidence for mercury-silver interaction,” *Journal of Physical Chemistry C*, vol. 124, no. 47, pp. 25975–25983, 2020, doi: 10.1021/acs.jpcc.0c06951.
- [239] G. Vasquez, Y. Hernández, and Y. Coello, “Portable low-cost instrumentation for monitoring Rayleigh scattering from chemical sensors based on metallic nanoparticles,” *Sci Rep*, vol. 8, no. 1, pp. 22–25, 2018, doi: 10.1038/s41598-018-33271-8.
- [240] I. Fratoddi *et al.*, “Silver nanoparticles functionalized by fluorescein isothiocyanate or rhodamine b isothiocyanate: Fluorescent and plasmonic materials,” *Applied Sciences (Switzerland)*, vol. 11, no. 6, 2021, doi: 10.3390/app11062472.
- [241] P. Kainourgios, L. A. Tziveleka, I. A. Kartsonakis, E. Ioannou, V. Roussis, and C. A. Charitidis, “Silver nanoparticles grown on cross-linked poly (Methacrylic acid) microspheres: Synthesis, characterization, and antifungal activity evaluation,” *Chemosensors*, vol. 9, no. 7, 2021, doi: 10.3390/chemosensors9070152.
- [242] F. Rinaldi *et al.*, “Hydrophilic silver nanoparticles loaded into niosomes: Physical–chemical characterization in view of biological applications,” *Nanomaterials*, vol. 9, no. 8, 2019, doi: 10.3390/nano9081177.
- [243] E. A. Kukushkina, S. I. Hossain, M. C. Sportelli, N. Ditaranto, R. A. Picca, and N. Cioffi, “Ag-based synergistic antimicrobial composites. A critical review,” *Nanomaterials*, vol. 11, no. 7, 2021, doi: 10.3390/nano11071687.
- [244] A. Ross, M. Muñoz, B. H. Rotstein, E. J. Suuronen, and E. I. Alarcon, “A low cost and open access system for rapid synthesis of large volumes of gold and silver nanoparticles,” *Sci Rep*, vol. 11, no. 1, p. 5420, 2021, doi: 10.1038/s41598-021-84896-1.
- [245] S. Naqvi *et al.*, “Synthesis and characterization of maltol capped silver nanoparticles and their potential application as an antimicrobial agent and colorimetric sensor for cysteine,” *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 229, p. 118002, 2020, doi: 10.1016/j.saa.2019.118002.
- [246] V. Jassal, U. Shanker, and B. S. Kaith, “*Aegle marmelos* mediated green synthesis of different nanostructured metal hexacyanoferrates: activity against photodegradation of harmful organic dyes,” *Scientifica (Cairo)*, vol. 2016, 2016, doi: 10.1155/2016/2715026.

- [247] L. and E. M. J. Pourzahedi, "Comparative life cycle assessment of silver nanoparticle synthesis routes," *Environ Sci Nano*, vol. 2, no. 4, pp. 361–369, 2015, doi: 10.4135/9781446247501.n1321.
- [248] H. Barabadi *et al.*, "Green nanotechnology-based gold nanomaterials for hepatic cancer therapeutics: A systematic review," *Iranian Journal of Pharmaceutical Research*, vol. 19, no. 3, pp. 3–17, 2020, doi: 10.22037/ijpr.2020.113820.14504.
- [249] K. B. Narayanan and N. Sakthivel, "Facile green synthesis of gold nanostructures by NADPH-dependent enzyme from the extract of *Sclerotium rolfsii*," *Colloids Surf A Physicochem Eng Asp*, vol. 380, no. 1–3, pp. 156–161, May 2011, doi: 10.1016/j.colsurfa.2011.02.042.
- [250] K. B. Narayanan and N. Sakthivel, "Phytosynthesis of gold nanoparticles using leaf extract of *Coleus amboinicus* Lour," *Mater Charact*, vol. 61, no. 11, pp. 1232–1238, Nov. 2010, doi: 10.1016/j.matchar.2010.08.003.
- [251] H. Barabadi *et al.*, "Green synthesis, characterization, antibacterial and biofilm inhibitory activity of silver nanoparticles compared to commercial silver nanoparticles," *Inorg Chem Commun*, vol. 129, p. 108647, Jul. 2021, doi: 10.1016/J.INOCHE.2021.108647.
- [252] M. Saravanan, H. Barabadi, B. Ramachandran, G. Venkatraman, and K. Ponmurugan, *Emerging plant-based anti-cancer green nanomaterials in present scenario*, 1st ed., vol. 87. Elsevier B.V., 2019. doi: 10.1016/bs.coac.2019.09.001.
- [253] U. Shanker, V. Jassal, M. Rani, and B. S. Kaith, "Towards green synthesis of nanoparticles: From bio-assisted sources to benign solvents. A review," *International Journal of Environmental Analytical Chemistry*, vol. 96, pp. 801–835, Jul. 14, 2016. doi: 10.1080/03067319.2016.1209663.
- [254] M. A. Faramarzi and A. Sadighi, "Insights into biogenic and chemical production of inorganic nanomaterials and nanostructures," *Adv Colloid Interface Sci*, vol. 189–190, pp. 1–20, 2013, doi: 10.1016/j.cis.2012.12.001.

- [255] M. Rai *et al.*, “Fusarium as a novel fungus for the synthesis of nanoparticles: Mechanism and applications,” *Journal of Fungi*, vol. 7, no. 2, pp. 1–24, 2021, doi: 10.3390/jof7020139.
- [256] E. Priyadarshini, S. S. Priyadarshini, B. G. Cousins, and N. Pradhan, “Metal-Fungus interaction: Review on cellular processes underlying heavy metal detoxification and synthesis of metal nanoparticles,” *Chemosphere*, vol. 274, p. 129976, 2021, doi: 10.1016/j.chemosphere.2021.129976.
- [257] K. S. Siddiqi and A. Husen, “Fabrication of metal nanoparticles from fungi and metal salts: scope and application,” *Nanoscale Res Lett*, vol. 11, no. 1, pp. 1–15, 2016, doi: 10.1186/s11671-016-1311-2.
- [258] P. Mukherjee *et al.*, “Fungus-mediated synthesis of silver nanoparticles and their immobilization in the mycelial matrix: a novel biological approach to nanoparticle synthesis,” *Nano Lett*, vol. 1, no. 10, pp. 515–519, 2001, doi: 10.1021/nl0155274.
- [259] A. Ahmad *et al.*, “Extracellular biosynthesis of silver nanoparticles using the fungus *Fusarium oxysporum*,” *Colloids Surf B Biointerfaces*, vol. 28, no. 4, pp. 313–318, 2003, doi: 10.1016/S0927-7765(02)00174-1.
- [260] V. Patel, D. Berthold, P. Puranik, and M. Gantar, “Screening of cyanobacteria and microalgae for their ability to synthesize silver nanoparticles with antibacterial activity,” *Biotechnology Reports*, vol. 5, no. 1, pp. 112–119, 2015, doi: 10.1016/j.btre.2014.12.001.
- [261] R. R. R. Kannan, R. Arumugam, D. Ramya, K. Manivannan, and P. Anantharaman, “Green synthesis of silver nanoparticles using marine macroalga *Chaetomorpha linum*,” *Applied Nanoscience (Switzerland)*, vol. 3, no. 3, pp. 229–233, 2013, doi: 10.1007/s13204-012-0125-5.
- [262] S. Baker, B. P. Harini, D. Rakshith, and S. Satish, “Marine microbes: Invisible nanofactories,” *J Pharm Res*, vol. 6, no. 3, pp. 383–388, 2013, doi: 10.1016/j.jopr.2013.03.001.

- [263] R. R. Nayak *et al.*, “Green synthesis of silver nanoparticle by *Penicillium purpurogenum* NPMF: The process and optimization,” *Journal of Nanoparticle Research*, vol. 13, no. 8, pp. 3129–3137, 2011, doi: 10.1007/s11051-010-0208-8.
- [264] Z. Bao, J. Cao, G. Kang, and C. Q. Lan, “Effects of reaction conditions on light-dependent silver nanoparticle biosynthesis mediated by cell extract of green alga *Neochloris oleoabundans*,” *Environmental Science and Pollution Research*, vol. 26, no. 3, pp. 2873–2881, 2019, doi: 10.1007/s11356-018-3843-8.
- [265] J. McTeer, A. P. Dean, K. N. White, and J. K. Pittman, “Bioaccumulation of silver nanoparticles into *Daphnia magna* from a freshwater algal diet and the impact of phosphate availability,” *Nanotoxicology*, vol. 8, no. 3, pp. 305–316, 2014, doi: 10.3109/17435390.2013.778346.
- [266] J. Wang and C. Chen, “Biosorbents for heavy metals removal and their future,” *Biotechnol Adv*, vol. 27, no. 2, pp. 195–226, 2009, doi: 10.1016/j.biotechadv.2008.11.002.
- [267] I. Barwal, P. Ranjan, S. Kateriya, and S. C. Yadav, “Cellular oxido-reductive proteins of *Chlamydomonas reinhardtii* control the biosynthesis of silver nanoparticles,” *J Nanobiotechnology*, vol. 9, pp. 1–12, 2011, doi: 10.1186/1477-3155-9-56.
- [268] R. Rattan, S. Shukla, B. Sharma, and M. Bhat, “A mini-review on lichen-based nanoparticles and their applications as antimicrobial agents,” *Front Microbiol*, vol. 12, no. March, pp. 1–7, 2021, doi: 10.3389/fmicb.2021.633090.
- [269] K. S. Siddiqi, M. Rashid, A. Rahman, A. Husen, and S. Rehman, “Biogenic fabrication and characterization of silver nanoparticles using aqueous-ethanolic extract of lichen (*Usnea longissima*) and their antimicrobial activity,” *Biomater Res*, vol. 22, no. 1, pp. 1–9, 2018, doi: 10.1186/s40824-018-0135-9.
- [270] P. Khandel, S. Kumar Shahi, L. Kanwar, R. Kumar Yadaw, and D. Kumar Soni, “Biochemical profiling of microbes inhibiting Silver nanoparticles using symbiotic organisms,” *International Journal of Nano Dimension (Ijnd)*, vol. 9, no. 3, pp. 273–285, 2018.

- [271] A. D. Gandhi, K. Murugan, K. Umamahesh, R. Babujanarthanam, P. Kavitha, and A. Selvi, "Lichen *Parmelia sulcata* mediated synthesis of gold nanoparticles: an eco-friendly tool against *Anopheles stephensi* and *Aedes aegypti*," *Environmental Science and Pollution Research*, vol. 26, no. 23, pp. 23886–23898, 2019, doi: 10.1007/s11356-019-05726-6.
- [272] M. Alavi, N. Karimi, and T. Valadbeigi, "Antibacterial, antibiofilm, anti-quorum sensing, antimotility, and antioxidant activities of green fabricated Ag, Cu, TiO₂, ZnO, and Fe₃O₄ NPs via *Protoparmeliopsis muralis* lichen aqueous extract against multi-drug-resistant bacteria," *ACS Biomater Sci Eng*, vol. 5, no. 9, pp. 4228–4243, 2019, doi: 10.1021/acsbiomaterials.9b00274.
- [273] R. Safarkar, G. Ebrahimzadeh, and S. Khalili-arjaghi, "The study of antibacterial properties of iron oxide nanoparticles synthesized using the extract of lichen *Ramalina sinensis*," *Asian Journal of Nanoscience and Materials*, vol. 3, pp. 157–166, 2020, doi: 10.26655/AJNANOMAT.2020.3.1.
- [274] M. Goga *et al.*, "Biological activity of selected lichens and lichen-based Ag nanoparticles prepared by a green solid-state mechanochemical approach," *Materials Science and Engineering C*, vol. 119, p. 111640, 2021, doi: 10.1016/j.msec.2020.111640.
- [275] M. Baláž *et al.*, "Biomechanochemical solid-state synthesis of silver nanoparticles with antibacterial activity using lichens," *ACS Sustain Chem Eng*, vol. 8, no. 37, pp. 13945–13955, 2020, doi: 10.1021/acssuschemeng.0c03211.
- [276] S. M. Abdullah, K. Kolo, and S. M. Sajadi, "Greener pathway toward the synthesis of lichen-based ZnO@TiO₂@SiO₂ and Fe₃O₄@SiO₂ nanocomposites and investigation of their biological activities," *Food Sci Nutr*, vol. 8, no. 8, pp. 4044–4054, 2020, doi: 10.1002/fsn3.1661.
- [277] V. Soni *et al.*, "Sustainable and green trends in using plant extracts for the synthesis of biogenic metal nanoparticles toward environmental and pharmaceutical advances: A review," *Environ Res*, vol. 202, no. April, p. 111622, 2021, doi: 10.1016/j.envres.2021.111622.
- [278] K. Vijayaraghavan and T. Ashokkumar, "Plant-mediated biosynthesis of metallic nanoparticles: A review of literature, factors affecting synthesis, characterization

- techniques and applications,” *J Environ Chem Eng*, vol. 5, no. 5, pp. 4866–4883, 2017, doi: 10.1016/j.jece.2017.09.026.
- [279] H. Chandra, P. Kumari, E. Bontempi, and S. Yadav, “Medicinal plants: Treasure trove for green synthesis of metallic nanoparticles and their biomedical applications,” *Biocatal Agric Biotechnol*, vol. 24, no. September 2019, p. 101518, 2020, doi: 10.1016/j.bcab.2020.101518.
- [280] S. Priyadarshini, A. Mainal, F. Sonsudin, R. Yahya, A. A. Alyousef, and A. Mohammed, “Biosynthesis of TiO₂ nanoparticles and their superior antibacterial effect against human nosocomial bacterial pathogens,” *Research on Chemical Intermediates*, vol. 46, no. 2, pp. 1077–1089, 2020, doi: 10.1007/s11164-019-03857-6.
- [281] J. Premkumar, T. Sudhakar, A. Dhakal, J. B. Shrestha, S. Krishnakumar, and P. Balashanmugam, “Synthesis of silver nanoparticles (AgNPs) from cinnamon against bacterial pathogens,” *Biocatal Agric Biotechnol*, vol. 15, pp. 311–316, 2018, doi: 10.1016/j.bcab.2018.06.005.
- [282] N. K. Hemanth Kumar, J. D. Andia, S. Manjunatha, M. Murali, K. N. Amruthesh, and S. Jagannath, “Antimitotic and DNA-binding potential of biosynthesized ZnO-NPs from leaf extract of *Justicia wynaadensis* (Nees) Heyne - A medicinal herb,” *Biocatal Agric Biotechnol*, vol. 18, no. January, p. 101024, 2019, doi: 10.1016/j.bcab.2019.101024.
- [283] E. B. Tirkolaei, I. Mahdavi, M. M. S. Esfahani, and G. W. Weber, “A robust green location-allocation-inventory problem to design an urban waste management system under uncertainty,” *Waste Management*, vol. 102, pp. 340–350, 2020, doi: 10.1016/j.wasman.2019.10.038.
- [284] U. S. Environmental Protection Agency, “National Overview: Facts and Figures on Materials, Wastes and Recycling,” *EPA*, pp. 1–13, 2018, doi: <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>.
- [285] K. Anand, K. Kaviyarasu, S. Muniyasamy, S. M. Roopan, R. M. Gengan, and A. A. Chuturgoon, “Bio-synthesis of silver nanoparticles using agroforestry residue and their catalytic degradation for sustainable waste management,” *J Clust Sci*, vol. 28, no. 4, pp. 2279–2291, 2017, doi: 10.1007/s10876-017-1212-2.

- [286] A. Acharya and P. K. Pal, "Agriculture nanotechnology: Translating research outcome to field applications by influencing environmental sustainability," *NanoImpact*, vol. 19. Elsevier B.V., Jul. 01, 2020. doi: 10.1016/j.impact.2020.100232.
- [287] S. Ahmed, G. Kaur, P. Sharma, S. Singh, and S. Ikram, "Fruit waste (peel) as bio-reductant to synthesize silver nanoparticles with antimicrobial , antioxidant and cytotoxic activities," *Journal of Economics, Finance and Administrative Science*, 2018, doi: 10.1016/j.jab.2018.02.002.
- [288] D. Sharma and A. Chaudhary, "Synthesis of quercetin functionalized silver nanoparticles and their application for the colorimetric detection of l-cysteine in biologically complex fluids," *ChemistrySelect*, vol. 7, no. 8, p. e202104147, Feb. 2022, doi: <https://doi.org/10.1002/slct.202104147>.
- [289] Q. Zhong *et al.*, "One-pot synthesis of highly stable CsPbBr₃@SiO₂ core-shell nanoparticles," *ACS Nano*, vol. 12, no. 8, pp. 8579–8587, Aug. 2018, doi: 10.1021/acsnano.8b04209.
- [290] Z. S. Lv, X. Y. Zhu, H. bin Meng, J. J. Feng, and A. J. Wang, "One-pot synthesis of highly branched Pt@Ag core-shell nanoparticles as a recyclable catalyst with dramatically boosting the catalytic performance for 4-nitrophenol reduction," *J Colloid Interface Sci*, vol. 538, pp. 349–356, Mar. 2019, doi: 10.1016/j.jcis.2018.11.109.
- [291] I. Kumar, M. Mondal, V. Meyappan, and N. Sakthivel, "Green one-pot synthesis of gold nanoparticles using *Sansevieria roxburghiana* leaf extract for the catalytic degradation of toxic organic pollutants," *Mater Res Bull*, vol. 117, pp. 18–27, Sep. 2019, doi: 10.1016/j.materresbull.2019.04.029.
- [292] F. Ahmad *et al.*, "One-pot synthesis and characterization of in-house engineered silver nanoparticles from *Flacourtia jangomas* fruit extract with effective antibacterial profiles," *J Nanostructure Chem*, vol. 11, no. 1, pp. 131–141, Mar. 2021, doi: 10.1007/s40097-020-00354-w.
- [293] N. Abbasi, H. Ghaneialvar, R. Moradi, M. M. Zangeneh, and A. Zangeneh, "Formulation and characterization of a novel cutaneous wound healing ointment by silver nanoparticles containing Citrus lemon leaf: A chemobiological study," *Arabian Journal of Chemistry*, vol. 14, no. 7, p. 103246, 2021, doi: 10.1016/j.arabjc.2021.103246.

- [294] E. F. El-Belely *et al.*, “Green synthesis of zinc oxide nanoparticles (Zno-nps) using *Arthrospira platensis* (class: Cyanophyceae) and evaluation of their biomedical activities,” *Nanomaterials*, vol. 11, no. 1, pp. 1–18, 2021, doi: 10.3390/nano11010095.
- [295] D. Preetha, R. Arun, P. Kumari, and C. Aarti, “Synthesis and characterization of silver nanoparticles using cannonball leaves and their cytotoxic activity against MCF-7 cell line,” *J Nanotechnol*, pp. 1–5, 2013.
- [296] F. Faghizadeh, N. M. Anaya, L. A. Schifman, and V. Oyanedel-Craver, “Fourier transform infrared spectroscopy to assess molecular-level changes in microorganisms exposed to nanoparticles,” *Nanotechnology for Environmental Engineering*, vol. 1, no. 1, pp. 1–16, 2016, doi: 10.1007/s41204-016-0001-8.
- [297] J. Pachiyappan, N. Gnanasundaram, and G. L. Rao, “Preparation and characterization of ZnO, MgO and ZnO–MgO hybrid nanomaterials using green chemistry approach,” *Results in Materials*, vol. 7, p. 100104, 2020, doi: 10.1016/j.rinma.2020.100104.
- [298] T. K. Pathak, E. Coetsee-Hugo, H. C. Swart, C. W. Swart, and R. E. Kroon, “Preparation and characterization of Ce doped ZnO nanomaterial for photocatalytic and biological applications,” *Mater Sci Eng B Solid State Mater Adv Technol*, vol. 261, no. September, p. 114780, 2020, doi: 10.1016/j.mseb.2020.114780.
- [299] J. Lim, S. P. Yeap, H. X. Che, and S. C. Low, “Characterization of magnetic nanoparticle by dynamic light scattering,” *Nanoscale Res Lett*, vol. 8, no. 1, pp. 1–14, 2013, doi: 10.1186/1556-276X-8-381.
- [300] P. M. Carvalho, M. R. Felício, N. C. Santos, S. Gonçalves, and M. M. Domingues, “Application of light scattering techniques to nanoparticle characterization and development,” *Front Chem*, vol. 6, no. June, pp. 1–17, 2018, doi: 10.3389/fchem.2018.00237.
- [301] R. Vogel *et al.*, “High-resolution single particle zeta potential characterisation of biological nanoparticles using tunable resistive pulse sensing,” *Sci Rep*, vol. 7, no. 1, pp. 1–13, 2017, doi: 10.1038/s41598-017-14981-x.
- [302] M. Kamshad, M. Jahanshah Talab, S. Beigoli, A. Sharifirad, and J. Chamani, “Use of spectroscopic and zeta potential techniques to study the interaction between lysozyme

- and curcumin in the presence of silver nanoparticles at different sizes,” *J Biomol Struct Dyn*, vol. 37, no. 8, pp. 2030–2040, 2019, doi: 10.1080/07391102.2018.1475258.
- [303] K. Cacia, F. Ordoñez, C. Zapata, B. Herrera, E. Pabón, and R. Buitrago-Sierra, “Surfactant concentration and pH effects on the zeta potential values of alumina nanofluids to inspect stability,” *Colloids Surf A Physicochem Eng Asp*, vol. 583, no. July, 2019, doi: 10.1016/j.colsurfa.2019.123960.
- [304] G. Pipintakos, N. Hasheminejad, C. Lommaert, A. Bocharova, and J. Blom, “Application of Atomic Force (AFM), Environmental Scanning Electron (ESEM) and Confocal Laser Scanning Microscopy (CLSM) in bitumen: A review of the ageing effect,” *Micron*, vol. 147, no. May, p. 103083, 2021, doi: 10.1016/j.micron.2021.103083.
- [305] S. Nindawat and V. Agrawal, “Fabrication of silver nanoparticles using *Arnebia hispidissima* (Lehm.) A. DC. root extract and unravelling their potential biomedical applications,” *Artif Cells Nanomed Biotechnol*, vol. 47, no. 1, pp. 166–180, 2019, doi: 10.1080/21691401.2018.1548469.
- [306] E. Roy, S. Patra, R. Madhuri, and P. K. Sharma, “Anisotropic gold nanoparticle decorated magnetopolymersome: an advanced nanocarrier for targeted photothermal therapy and dual-mode responsive T1 MRI imaging,” *ACS Biomater Sci Eng*, vol. 3, no. 5, pp. 816–831, 2017, doi: 10.1021/acsbomaterials.7b00089.
- [307] J. Santhoshkumar, S. Rajeshkumar, and S. Venkat Kumar, “Phyto-assisted synthesis, characterization and applications of gold nanoparticles – A review,” *Biochem Biophys Rep*, vol. 11, pp. 46–57, 2017, doi: 10.1016/j.bbrep.2017.06.004.
- [308] R. Mariychuk, D. Grulova, L. M. Grishchenko, R. P. Linnik, and V. V. Lisnyak, “Green synthesis of non-spherical gold nanoparticles using *Solidago canadensis* L. extract,” *Applied Nanoscience (Switzerland)*, vol. 10, no. 12, pp. 4817–4826, 2020, doi: 10.1007/s13204-020-01406-x.
- [309] R. P. Das, V. V. Gandhi, B. G. Singh, and A. Kunwar, “A pH-controlled one-pot synthesis of gold nanostars by using a zwitterionic protein hydrolysate (gelatin): an enhanced radiosensitization of cancer cells,” *New Journal of Chemistry*, vol. 45, no. 30, pp. 13271–13279, 2021, doi: 10.1039/d1nj01903a.

- [310] K. Folens *et al.*, “Identification of platinum nanoparticles in road dust leachate by single particle inductively coupled plasma-mass spectrometry,” *Science of the Total Environment*, vol. 615, pp. 849–856, 2018, doi: 10.1016/j.scitotenv.2017.09.285.
- [311] H. Wang, B. Chen, M. He, X. Li, P. Chen, and B. Hu, “Study on uptake of gold nanoparticles by single cells using droplet microfluidic chip-inductively coupled plasma mass spectrometry,” *Talanta*, vol. 200, no. November 2018, pp. 398–407, 2019, doi: 10.1016/j.talanta.2019.03.075.
- [312] J. Zhong and J. Yan, “Seeing is believing: Atomic force microscopy imaging for nanomaterial research,” *RSC Adv*, vol. 6, no. 2, pp. 1103–1121, 2016, doi: 10.1039/c5ra22186b.
- [313] L. Bozec and M. Horton, “Topography and mechanical properties of single molecules of type I collagen using atomic force microscopy,” *Biophys J*, vol. 88, no. 6, pp. 4223–4231, 2005, doi: 10.1529/biophysj.104.055228.
- [314] A. A. Tseng, “Advancements and challenges in development of atomic force microscopy for nanofabrication,” *Nano Today*, vol. 6, no. 5, pp. 493–509, 2011, doi: 10.1016/j.nantod.2011.08.003.
- [315] A. A. Yaqoob *et al.*, “Recent advances in metal decorated nanomaterials and their various biological applications: a review,” *Front Chem*, vol. 8, no. May, pp. 1–23, 2020, doi: 10.3389/fchem.2020.00341.
- [316] V. Dogra, G. Kaur, S. Jindal, R. Kumar, S. Kumar, and N. K. Singhal, “Bactericidal effects of metallosurfactants based cobalt oxide/hydroxide nanoparticles against *Staphylococcus aureus*,” *Science of the Total Environment*, vol. 681, pp. 350–364, Sep. 2019, doi: 10.1016/j.scitotenv.2019.05.078.
- [317] S. Chandna, N. S. Thakur, R. Kaur, and J. Bhaumik, “Lignin-bimetallic nanoconjugate doped pH-responsive hydrogels for laser-assisted antimicrobial photodynamic therapy,” *Biomacromolecules*, vol. 21, no. 8, pp. 3216–3230, Aug. 2020, doi: 10.1021/acs.biomac.0c00695.
- [318] J. Bhaumik, A. K. Mittal, A. Banerjee, Y. Chisti, and U. C. Banerjee, “Applications of phototheranostic nanoagents in photodynamic therapy,” *Nano Research*, vol. 8, no. 5.

- Tsinghua University Press, pp. 1373–1394, May 18, 2015. doi: 10.1007/s12274-014-0628-3.
- [319] A. Sachdev and P. Gopinath, “Monitoring the intracellular distribution and ROS scavenging potential of carbon dot–cerium oxide nanocomposites in fibroblast cells,” *ChemNanoMat*, vol. 2, no. 3, pp. 226–235, Mar. 2016, doi: 10.1002/cnma.201500224.
- [320] A. K. Srivastava, A. Dev, and S. Karmakar, “Nanosensors and nanobiosensors in food and agriculture,” *Environmental Chemistry Letters*, vol. 16, no. 1. Springer Verlag, pp. 161–182, Mar. 01, 2018. doi: 10.1007/s10311-017-0674-7.
- [321] A. Gogos, K. Knauer, and T. D. Bucheli, “Nanomaterials in plant protection and fertilization: Current state, foreseen applications, and research priorities,” *J Agric Food Chem*, vol. 60, no. 39, pp. 9781–9792, 2012, doi: 10.1021/jf302154y.
- [322] M. Devi, S. Devi, V. Sharma, N. Rana, R. K. Bhatia, and A. K. Bhatt, “Green synthesis of silver nanoparticles using methanolic fruit extract of *Aegle marmelos* and their antimicrobial potential against human bacterial pathogens,” *J Tradit Complement Med*, vol. 10, no. 2, pp. 158–165, Mar. 2020, doi: 10.1016/j.jtcme.2019.04.007.
- [323] P. Dubey, B. Bhushan, A. Sachdev, I. Matai, S. Uday Kumar, and P. Gopinath, “Silver-nanoparticle-Incorporated composite nanofibers for potential wound-dressing applications,” *J Appl Polym Sci*, vol. 132, no. 35, Sep. 2015, doi: 10.1002/app.42473.
- [324] A. Kumar, P. K. Vemula, P. M. Ajayan, and G. John, “Silver-nanoparticle-embedded antimicrobial paints based on vegetable oil,” *Nat Mater*, vol. 7, no. 3, pp. 236–241, 2008, doi: 10.1038/nmat2099.
- [325] A. Dror-Ehre, H. Mamane, T. Belenkova, G. Markovich, and A. Adin, “Silver nanoparticle-*E. coli* colloidal interaction in water and effect on *E. coli* survival,” *J Colloid Interface Sci*, vol. 339, no. 2, pp. 521–526, 2009, doi: 10.1016/j.jcis.2009.07.052.
- [326] K. Kalimuthu *et al.*, “Control of dengue and Zika virus vector *Aedes aegypti* using the predatory copepod *Megacyclops formosanus*: Synergy with *Hedychium coronarium*-synthesized silver nanoparticles and related histological changes in targeted

- mosquitoes,” *Process Safety and Environmental Protection*, vol. 109, pp. 82–96, 2017, doi: 10.1016/j.psep.2017.03.027.
- [327] S. Bhowmick and V. Koul, “Assessment of PVA/silver nanocomposite hydrogel patch as antimicrobial dressing scaffold: Synthesis, characterization and biological evaluation,” *Materials Science and Engineering C*, vol. 59, pp. 109–119, Feb. 2016, doi: 10.1016/j.msec.2015.10.003.
- [328] P. Makvandi, C. Yu Wang, E. N. Zare, A. Borzacchiello, L. Na Niu, and F. R. Tay, “Metal-based nanomaterials in biomedical applications: antimicrobial activity and cytotoxicity aspects,” *Adv Funct Mater*, vol. 30, no. 22, 2020, doi: 10.1002/adfm.201910021.
- [329] P. Rajapaksha *et al.*, “Antibacterial properties of graphene oxide-copper oxide nanoparticle nanocomposites,” *ACS Appl Bio Mater*, vol. 2, no. 12, pp. 5687–5696, Dec. 2019, doi: 10.1021/acsabm.9b00754.
- [330] J. Xiong, Y. Wang, Q. Xue, and X. Wu, “Synthesis of highly stable dispersions of nanosized copper particles using L-ascorbic acid,” *Green Chemistry*, vol. 13, no. 4, pp. 900–904, 2011, doi: 10.1039/c0gc00772b.
- [331] S. E.-D. Hassan, S. S. Salem, A. Fouda, M. A. Awad, M. S. El-Gamal, and A. M. Abdo, “New approach for antimicrobial activity and bio-control of various pathogens by biosynthesized copper nanoparticles using endophytic actinomycetes,” *J Radiat Res Appl Sci*, vol. 11, no. 3, pp. 262–270, 2018, doi: 10.1016/j.jrras.2018.05.003.
- [332] M. Hasanin, M. A. Al Abboud, M. M. Alawlaqi, T. M. Abdelghany, and A. H. Hashem, “Ecofriendly synthesis of biosynthesized copper nanoparticles with starch-based nanocomposite: antimicrobial, antioxidant, and anticancer activities,” *Biol Trace Elem Res*, no. 0123456789, pp. 14–16, 2021, doi: 10.1007/s12011-021-02812-0.
- [333] D. Garibo *et al.*, “Green synthesis of silver nanoparticles using *Lysiloma acapulcensis* exhibit high-antimicrobial activity,” *Sci Rep*, vol. 10, no. 1, pp. 1–11, 2020, doi: 10.1038/s41598-020-69606-7.

- [334] R. Vazquez-Muñoz *et al.*, “Enhancement of antibiotics antimicrobial activity due to the silver nanoparticles impact on the cell membrane,” *PLoS One*, vol. 14, no. 11, pp. 1–18, 2019, doi: 10.1371/journal.pone.0224904.
- [335] Y. Y. Loo *et al.*, “In Vitro antimicrobial activity of green synthesized silver nanoparticles against selected Gram-negative foodborne pathogens,” *Front Microbiol*, vol. 9, no. JUL, pp. 1–7, 2018, doi: 10.3389/fmicb.2018.01555.
- [336] A. Folorunso *et al.*, “Biosynthesis, characterization and antimicrobial activity of gold nanoparticles from leaf extracts of *Annona muricata*,” *J Nanostructure Chem*, vol. 9, no. 2, pp. 111–117, 2019, doi: 10.1007/s40097-019-0301-1.
- [337] S. Parveen, A. H. Wani, M. A. Shah, H. S. Devi, M. Y. Bhat, and J. A. Koka, “Preparation, characterization and antifungal activity of iron oxide nanoparticles,” *Microb Pathog*, vol. 115, no. December 2017, pp. 287–292, 2018, doi: 10.1016/j.micpath.2017.12.068.
- [338] P. Ponmurugan, K. Manjugarunambika, V. Elango, and B. M. Gnanamangai, “Antifungal activity of biosynthesised copper nanoparticles evaluated against red root-rot disease in tea plants,” *J Exp Nanosci*, vol. 11, no. 13, pp. 1019–1031, 2016, doi: 10.1080/17458080.2016.1184766.
- [339] D. H. Nguyen *et al.*, “Green silver nanoparticles formed by *Phyllanthus urinaria*, *Pouzolzia zeylanica*, and *Scoparia dulcis* leaf extracts and the antifungal activity,” *Nanomaterials*, vol. 10, no. 3, 2020, doi: 10.3390/nano10030542.
- [340] A. M. Pillai *et al.*, “Green synthesis and characterization of zinc oxide nanoparticles with antibacterial and antifungal activity,” *J Mol Struct*, vol. 1211, Jul. 2020, doi: 10.1016/j.molstruc.2020.128107.
- [341] M. A. Yassin, A. M. Elgorban, A. E. R. M. A. El-Samawaty, and B. M. A. Almunqedhi, “Biosynthesis of silver nanoparticles using *Penicillium verrucosum* and analysis of their antifungal activity,” *Saudi J Biol Sci*, vol. 28, no. 4, pp. 2123–2127, 2021, doi: 10.1016/j.sjbs.2021.01.063.

- [342] T. M. Dawoud, M. A. Yassin, A. R. M. El-Samawaty, and A. M. Elgorban, “Silver nanoparticles synthesized by *Nigrospora oryzae* showed antifungal activity,” *Saudi J Biol Sci*, vol. 28, no. 3, pp. 1847–1852, 2021, doi: 10.1016/j.sjbs.2020.12.036.
- [343] S. Galdiero, A. Falanga, M. Vitiello, M. Cantisani, V. Marra, and M. Galdiero, “Silver nanoparticles as potential antiviral agents,” *Molecules*, vol. 16, no. 10, pp. 8894–8918, 2011, doi: 10.3390/molecules16108894.
- [344] R. Kumar *et al.*, “Iron oxide nanoparticles based antiviral activity of H1N1 influenza A virus,” *Journal of Infection and Chemotherapy*, vol. 25, no. 5, pp. 325–329, 2019, doi: 10.1016/j.jiac.2018.12.006.
- [345] I. Das Jana *et al.*, “Copper nanoparticle-graphene composite-based transparent surface coating with antiviral activity against influenza virus,” *ACS Appl Nano Mater*, vol. 4, no. 1, pp. 352–362, 2021, doi: 10.1021/acsanm.0c02713.
- [346] P. Yugandhar, T. Vasavi, Y. Jayavardhana Rao, P. Uma Maheswari Devi, G. Narasimha, and N. Savithramma, “Cost effective, green synthesis of copper oxide nanoparticles using fruit extract of *Syzygium alternifolium* (Wt.) Walp., characterization and evaluation of antiviral activity,” *J Clust Sci*, vol. 29, no. 4, pp. 743–755, 2018, doi: 10.1007/s10876-018-1395-1.
- [347] F. Caputo, M. De Nicola, and L. Ghibelli, “Pharmacological potential of bioactive engineered nanomaterials,” *Biochem Pharmacol*, vol. 92, no. 1, pp. 112–130, 2014, doi: 10.1016/j.bcp.2014.08.015.
- [348] J. Bai Aswathanarayan, R. Rai Vittal, and U. Muddegowda, “Anticancer activity of metal nanoparticles and their peptide conjugates against human colon adenorectal carcinoma cells,” *Artif Cells Nanomed Biotechnol*, vol. 46, no. 7, pp. 1444–1451, 2018, doi: 10.1080/21691401.2017.1373655.
- [349] G. Lakshmanan, A. Sathiyaseelan, P. T. Kalaihelvan, and K. Murugesan, “Plant-mediated synthesis of silver nanoparticles using fruit extract of *Cleome viscosa* L.: Assessment of their antibacterial and anticancer activity,” *Karbala International Journal of Modern Science*, vol. 4, no. 1, pp. 61–68, 2018, doi: 10.1016/j.kijoms.2017.10.007.

- [350] M. P. Patil, E. Bayaraa, P. Subedi, L. L. A. Piad, N. H. Tarte, and G. Do Kim, "Biogenic synthesis, characterization of gold nanoparticles using *Lonicera japonica* and their anticancer activity on HeLa cells," *J Drug Deliv Sci Technol*, vol. 51, no. January, pp. 83–90, 2019, doi: 10.1016/j.jddst.2019.02.021.
- [351] L. Wang, J. Xu, Y. Yan, H. Liu, and F. Li, "Synthesis of gold nanoparticles from leaf *Panax notoginseng* and its anticancer activity in pancreatic cancer PANC-1 cell lines," *Artif Cells Nanomed Biotechnol*, vol. 47, no. 1, pp. 1216–1223, 2019, doi: 10.1080/21691401.2019.1593852.
- [352] K. Ganesan, V. K. Jothi, A. Natarajan, A. Rajaram, S. Ravichandran, and S. Ramalingam, "Green synthesis of copper oxide nanoparticles decorated with graphene oxide for anticancer activity and catalytic applications," *Arabian Journal of Chemistry*, vol. 13, no. 8, pp. 6802–6814, 2020, doi: 10.1016/j.arabjc.2020.06.033.
- [353] R. Zein, I. Alghoraibi, C. Soukkaieh, A. Salman, and A. Alahmad, "In-vitro anticancer activity against Caco-2 cell line of colloidal nano silver synthesized using aqueous extract of *Eucalyptus camaldulensis* leaves," *Heliyon*, vol. 6, no. 8, p. e04594, 2020, doi: 10.1016/j.heliyon.2020.e04594.
- [354] L. M. Rossi, J. L. Fiorio, M. A. S. Garcia, and C. P. Ferraz, "The role and fate of capping ligands in colloidally prepared metal nanoparticle catalysts," *Dalton Transactions*, vol. 47, no. 17, pp. 5889–5915, 2018, doi: 10.1039/c7dt04728b.
- [355] B. Hvolbæk, T. V. W. Janssens, B. S. Clausen, H. Falsig, C. H. Christensen, and J. K. Nørskov, "Catalytic activity of Au nanoparticles," *Nano Today*, vol. 2, no. 4, pp. 14–18, 2007, doi: 10.1016/S1748-0132(07)70113-5.
- [356] I. Bibi *et al.*, "Green and eco-friendly synthesis of cobalt-oxide nanoparticle: Characterization and photo-catalytic activity," *Advanced Powder Technology*, vol. 28, no. 9, pp. 2035–2043, 2017, doi: 10.1016/j.apt.2017.05.008.
- [357] I. Bibi *et al.*, "Nickel nanoparticle synthesis using *Camellia sinensis* as reducing and capping agent: Growth mechanism and photo-catalytic activity evaluation," *Int J Biol Macromol*, vol. 103, pp. 783–790, 2017, doi: 10.1016/j.ijbiomac.2017.05.023.

- [358] G. Wu *et al.*, “Fabrication of highly stable metal oxide hollow nanospheres and their catalytic activity toward 4-nitrophenol reduction,” *ACS Appl Mater Interfaces*, vol. 9, no. 21, pp. 18207–18214, 2017, doi: 10.1021/acsami.7b03120.
- [359] C. Dwivedi, A. Chaudhary, S. Srinivasan, and C. K. Nandi, “Polymer stabilized bimetallic alloy nanoparticles: synthesis and catalytic application,” *Colloids and Interface Science Communications*, vol. 24, pp. 62–67, May 2018, doi: 10.1016/j.colcom.2018.04.001.
- [360] S. B. Khan, “Metal nanoparticles containing chitosan wrapped cellulose nanocomposites for catalytic hydrogen production and reduction of environmental pollutants,” *Carbohydr Polym*, vol. 242, p. 116286, 2020, doi: 10.1016/j.carbpol.2020.116286.
- [361] H. Singh, G. Singh, N. Kaur, and N. Singh, “Pattern-based colorimetric sensor array to monitor food spoilage using automated high-throughput analysis,” *Biosens Bioelectron*, vol. 196, p. 113687, Jan. 2022, doi: 10.1016/J.BIOS.2021.113687.
- [362] N. Cyril *et al.*, “Catalytic activity of Derris trifoliata stabilized gold and silver nanoparticles in the reduction of isomers of nitrophenol and azo violet,” *Nano-Structures and Nano-Objects*, vol. 22, p. 100430, 2020, doi: 10.1016/j.nanoso.2020.100430.
- [363] E. A. Mwafy, A. M. Mostafa, N. S. Awwad, and H. A. Ibrahim, “Catalytic activity of multi-walled carbon nanotubes decorated with tungsten trioxides nanoparticles against 4-nitrophenol,” *Journal of Physics and Chemistry of Solids*, vol. 158, no. March, p. 110252, 2021, doi: 10.1016/j.jpcs.2021.110252.
- [364] A. Sharma, A. Kumar, K. R. Meena, S. Rana, M. Singh, and S. S. Kanwar, “Fabrication and functionalization of magnesium nanoparticle for lipase immobilization in n-propyl gallate synthesis,” *J King Saud Univ Sci*, vol. 29, no. 4, pp. 536–546, Oct. 2017, doi: 10.1016/j.jksus.2017.08.005.
- [365] G. Paramasivam, N. Kayambu, A. M. Rabel, A. K. Sundramoorthy, and A. Sundaramurthy, “Anisotropic noble metal nanoparticles: Synthesis, surface functionalization and applications in biosensing, bioimaging, drug delivery and theranostics,” *Acta Biomater*, vol. 49, pp. 45–65, 2017, doi: 10.1016/j.actbio.2016.11.066.

- [366] B. Veigas *et al.*, “Noble metal nanoparticles for biosensing applications,” pp. 1657–1687, 2012, doi: 10.3390/s120201657.
- [367] B. Della Ventura *et al.*, “Biosensor for point-of-care analysis of immunoglobulins in urine by metal enhanced fluorescence from gold nanoparticles,” *ACS Appl Mater Interfaces*, vol. 11, no. 4, pp. 3753–3762, 2019, doi: 10.1021/acsami.8b20501.
- [368] H. Dai, Y. Chen, X. Niu, C. Pan, H. L. Chen, and X. Chen, “High-performance electrochemical biosensor for nonenzymatic H₂O₂ sensing based on Au@C-Co₃O₄ heterostructures,” *Biosens Bioelectron*, vol. 118, pp. 36–43, 2018, doi: 10.1016/j.bios.2018.07.022.
- [369] J. Chang, X. Wang, J. Wang, H. Li, and F. Li, “Nucleic acid-functionalized metal-organic framework-based homogeneous electrochemical biosensor for simultaneous detection of multiple tumor biomarkers,” *Anal Chem*, vol. 91, no. 5, pp. 3604–3610, 2019, doi: 10.1021/acs.analchem.8b05599.
- [370] S. A. Hashemi, S. M. Mousavi, S. Bahrani, S. Ramakrishna, A. Babapoor, and W. H. Chiang, “Coupled graphene oxide with hybrid metallic nanoparticles as potential electrochemical biosensors for precise detection of ascorbic acid within blood,” *Anal Chim Acta*, vol. 1107, no. xxxx, pp. 183–192, 2020, doi: 10.1016/j.aca.2020.02.018.
- [371] A. Chaudhary, C. Dwivedi, M. Chawla, A. Gupta, and C. K. Nandi, “Lysine and dithiothreitol promoted ultrasensitive optical and colorimetric detection of mercury using anisotropic gold nanoparticles,” *J Mater Chem C Mater*, vol. 3, no. 27, pp. 6962–6965, 2015, doi: 10.1039/c5tc01397f.
- [372] P. Halkare, N. Punjabi, J. Wangchuk, A. Nair, K. Kondabagil, and S. Mukherji, “Bacteria functionalized gold nanoparticle matrix based fiber-optic sensor for monitoring heavy metal pollution in water,” *Sens Actuators B Chem*, vol. 281, pp. 643–651, 2019, doi: 10.1016/j.snb.2018.10.119.
- [373] N. Khaliq *et al.*, “Voltage-switchable biosensor with gold nanoparticles on TiO₂ nanotubes decorated with CdS quantum dots for the detection of cholesterol and H₂O₂,” *ACS Appl Mater Interfaces*, vol. 13, no. 3, pp. 3653–3668, 2021, doi: 10.1021/acsami.0c19979.

[374] H. Karimi-Maleh *et al.*, “Cyanazine herbicide monitoring as a hazardous substance by a DNA nanostructure biosensor,” *J Hazard Mater*, vol. 423, no. August 2021, 2022, doi: 10.1016/j.jhazmat.2021.127058.

CHAPTER 3

[375] P. v. Baptista *et al.*, “Nano-strategies to fight multidrug resistant bacteria-"A Battle of the Titans",” *Frontiers in Microbiology*, vol. 9, no. JUL. Frontiers Media S.A., Jul. 02, 2018. doi: 10.3389/fmicb.2018.01441.

[376] R. S. McInnes, G. E. McCallum, L. E. Lamberte, and W. van Schaik, “Horizontal transfer of antibiotic resistance genes in the human gut microbiome,” *Current Opinion in Microbiology*, vol. 53. Elsevier Ltd, pp. 35–43, Feb. 01, 2020. doi: 10.1016/j.mib.2020.02.002.

[377] S. B. Hoffman, “Mechanisms of antibiotic resistance,” *Compendium on Continuing Education for the Practicing Veterinarian*, vol. 23, no. 5, pp. 464–472, May 2001, doi: 10.1128/microbiolspec.vmbf-0016-2015.

[378] T. Adesina, O. Nwinyi, N. De, O. Akinnola, and E. Omonigbehin, “First detection of carbapenem-resistant escherichia fergusonii strains harbouring beta-lactamase genes from clinical samples,” *Pathogens*, vol. 8, no. 4, Dec. 2019, doi: 10.3390/pathogens8040164.

[379] J. J. Farmer Iii *et al.*, “Biochemical identification of new species and biogroups of enterobacteriaceae isolated from clinical specimenstt,” 1985. [Online]. Available: <https://journals.asm.org/journal/jcm>

[380] S. Onoue, S. Yamada, and H. K. Chan, “Nanodrugs: Pharmacokinetics and safety,” *International Journal of Nanomedicine*, vol. 9, no. 1. pp. 1025–1037, Feb. 20, 2014. doi: 10.2147/IJN.S38378.

[381] M. Salouti, Z. Heidari, A. Ahangari, and S. Zare, “Enhanced delivery of gentamicin to infection foci due to *Staphylococcus aureus* using gold nanorods,” *Drug Deliv*, vol. 23, no. 1, pp. 49–54, Jan. 2016, doi: 10.3109/10717544.2014.903533.

- [382] A. Ahangari, M. Salouti, Z. Heidari, A. R. Kazemizadeh, and A. A. Safari, "Development of gentamicin-gold nanospheres for antimicrobial drug delivery to Staphylococcal infected foci," *Drug Deliv*, vol. 20, no. 1, pp. 34–39, 2013, doi: 10.3109/10717544.2012.746402.
- [383] Clsi, "M07-A9: Methods for dilution antimicrobial susceptibility tests for bacteria that grow aerobically; approved standard—ninth edition." [Online]. Available: www.clsi.org.
- [384] S. C. Hyung, W. K. Jun, Y. N. Cha, and C. Kim, "A quantitative nitroblue tetrazolium assay for determining intracellular superoxide anion production in phagocytic cells," *J Immunoassay Immunochem*, vol. 27, no. 1, pp. 31–44, 2006, doi: 10.1080/15321810500403722.
- [385] R. S. Thombre, V. Shinde, E. Thaiparambil, S. Zende, and S. Mehta, "Antimicrobial activity and mechanism of inhibition of silver nanoparticles against extreme halophilic archaea," *Front Microbiol*, vol. 7, no. SEP, Sep. 2016, doi: 10.3389/fmicb.2016.01424.
- [386] Y. Zhao, Y. Tian, Y. Cui, W. Liu, W. Ma, and X. Jiang, "Small molecule-capped gold nanoparticles as potent antibacterial agents that target gram-negative bacteria," *J Am Chem Soc*, vol. 132, no. 35, pp. 12349–12356, Sep. 2010, doi: 10.1021/ja1028843.
- [387] S. Perni and P. Prokopovich, "Continuous release of gentamicin from gold nanocarriers," *RSC Adv*, vol. 4, no. 94, pp. 51904–51910, Oct. 2014, doi: 10.1039/c4ra10023a.
- [388] A. Bahuguna, I. Khan, V. K. Bajpai, and S. C. Kang, "MTT assay to evaluate the cytotoxic potential of a drug," *Bangladesh J Pharmacol*, vol. 12, no. 2, pp. 115–118, 2017, doi: 10.3329/bjp.v12i2.30892.
- [389] J. Tang and S. Man, "Green synthesis of colloidal gold by ethyl alcohol and NaOH at normal temperature," *Rare Metal Materials and Engineering*, vol. 42, no. 11, pp. 2232–2236, Nov. 2013, doi: 10.1016/s1875-5372(14)60027-8.
- [390] J. D. S. Newman and G. J. Blanchard, "Formation of gold nanoparticles using amine reducing agents," *Langmuir*, vol. 22, no. 13, pp. 5882–5887, Jun. 2006, doi: 10.1021/la060045z.

- [391] W. Haiss, N. T. K. Thanh, J. Aveyard, and D. G. Fernig, "Determination of size and concentration of gold nanoparticles from UV-Vis spectra," *Anal Chem*, vol. 79, no. 11, pp. 4215–4221, Jun. 2007, doi: 10.1021/ac0702084.
- [392] M. Y. Memar, R. Ghotaslou, M. Samiei, and K. Adibkia, "Antimicrobial use of reactive oxygen therapy: Current insights," *Infection and Drug Resistance*, vol. 11. Dove Medical Press Ltd., pp. 567–576, Apr. 24, 2018. doi: 10.2147/IDR.S142397.
- [393] V. Tiwari, N. Mishra, K. Gadani, P. S. Solanki, N. A. Shah, and M. Tiwari, "Mechanism of anti-bacterial activity of zinc oxide nanoparticle against Carbapenem-Resistant *Acinetobacter baumannii*," *Front Microbiol*, vol. 9, no. JUN, Jun. 2018, doi: 10.3389/fmicb.2018.01218.
- [394] J. N. Payne *et al.*, "Novel synthesis of kanamycin conjugated gold nanoparticles with potent antibacterial activity," *Front Microbiol*, vol. 7, no. MAY, 2016, doi: 10.3389/fmicb.2016.00607.
- [395] S. A. R. Kazmi, M. Z. Qureshi, S. Ali, and J. F. Masson, "In vitro drug release and biocatalysis from pH-responsive gold nanoparticles synthesized using doxycycline," *Langmuir*, vol. 35, no. 49, pp. 16266–16274, Dec. 2019, doi: 10.1021/acs.langmuir.9b02420.
- [396] X. Li *et al.*, "Functional gold nanoparticles as potent antimicrobial agents against multi-drug-resistant bacteria," *ACS Nano*, vol. 8, no. 10, pp. 10682–10686, Oct. 2014, doi: 10.1021/nn5042625.
- [397] R. Shukla, V. Bansal, M. Chaudhary, A. Basu, R. R. Bhonde, and M. Sastry, "Biocompatibility of gold nanoparticles and their endocytotic fate inside the cellular compartment: A microscopic overview," *Langmuir*, vol. 21, no. 23. pp. 10644–10654, Nov. 08, 2005. doi: 10.1021/la0513712.
- [398] V. Amendola and M. Meneghetti, "Size evaluation of gold nanoparticles by UV-vis spectroscopy," *Journal of Physical Chemistry C*, vol. 113, no. 11, pp. 4277–4285, Mar. 2009, doi: 10.1021/jp8082425.

- [399] D. Philip, “Synthesis and spectroscopic characterization of gold nanoparticles,” *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 71, no. 1, pp. 80–85, Nov. 2008, doi: 10.1016/j.saa.2007.11.012.

CHAPTER 4

- [400] J. Yin *et al.*, “l-Cysteine metabolism and its nutritional implications,” *Mol Nutr Food Res*, vol. 60, no. 1, pp. 134–146, 2016, doi: 10.1002/mnfr.201500031.
- [401] M. Hussain, N. Khaliq, A. A. Khan, M. Khan, G. Ali, and M. Maqbool, “Synthesis, characterization and electrochemical analysis of TiO₂ nanostructures for sensing L-Cysteine and hydrogen peroxide,” *Physica E Low Dimens Syst Nanostruct*, vol. 128, Apr. 2021, doi: 10.1016/j.physe.2020.114541.
- [402] Y. H. Cui *et al.*, “Detoxification of ionic liquids using glutathione, cysteine, and NADH: Toxicity evaluation by *Tetrahymena pyriformis*,” *Environmental Pollution*, vol. 276, May 2021, doi: 10.1016/j.envpol.2021.116725.
- [403] Z. Yu, C. Hu, L. Guan, W. Zhang, and J. Gu, “Green synthesis of cellulose nanofibrils decorated with ag nanoparticles and their application in colorimetric detection of l -cysteine,” *ACS Sustain Chem Eng*, vol. 8, no. 33, pp. 12713–12721, 2020, doi: 10.1021/acssuschemeng.0c04842.
- [404] J. Bhamore, K. A. Rawat, H. Basu, R. K. Singhal, and S. K. Kailasa, “Influence of molecular assembly and NaCl concentration on gold nanoparticles for colorimetric detection of cysteine and glutathione,” *Sens Actuators B Chem*, vol. 212, pp. 526–535, 2015, doi: 10.1016/j.snb.2015.01.133.
- [405] Y. Li *et al.*, “‘Red-to-blue’ colorimetric detection of cysteine via anti-etching of silver nanoprisms,” *Nanoscale*, vol. 6, no. 18, pp. 10631–10637, 2014, doi: 10.1039/c4nr03309d.
- [406] D. Rohilla, S. Chaudhary, N. Kaur, and A. Shanavas, “Dopamine functionalized CuO nanoparticles: A high valued ‘turn on’ colorimetric biosensor for detecting cysteine in human serum and urine samples,” *Materials Science and Engineering C*, vol. 110, no. January, p. 110724, 2020, doi: 10.1016/j.msec.2020.110724.

- [407] C. Gotor, C. Álvarez, M. Á. Bermúdez, I. Moreno, I. García, and L. C. Romero, “Low abundance does not mean less importance in cysteine metabolism,” *Plant Signal Behav*, vol. 5, no. 8, pp. 1028–1030, 2010, doi: 10.4161/psb.5.8.12296.
- [408] X. Hai, X. Lin, X. Chen, and J. Wang, “Highly selective and sensitive detection of cysteine with a graphene quantum dots-gold nanoparticles based core-shell nanosensor,” *Sens Actuators B Chem*, vol. 257, pp. 228–236, 2018, doi: 10.1016/j.snb.2017.10.169.
- [409] J. Chrastil, “Spectrophotometric determination of cysteine and cystine in urine,” *Analyst*, vol. 115, no. 10, pp. 1383–1384, 1990, doi: 10.1039/an9901501383.
- [410] S. Bidi, D. C. Reshma, B. Srinivas, P. Sharma, and S. Sankanagoudar, “Comparison of urinary amino acid excretory pattern in patients with type 2 diabetes mellitus and non-diabetic healthy controls at a tertiary referral hospital in India,” *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, vol. 14, no. 4, pp. 357–362, 2020, doi: 10.1016/j.dsx.2020.04.006.
- [411] H. Chen, B. Zhou, R. Ye, J. Zhu, and X. Bao, “Synthesis and evaluation of a new fluorescein and rhodamine B-based chemosensor for highly sensitive and selective detection of cysteine over other amino acids and its application in living cell imaging,” *Sens Actuators B Chem*, vol. 251, pp. 481–489, 2017, doi: 10.1016/j.snb.2017.05.078.
- [412] Z. Shen, G. Han, C. Liu, X. Wang, and R. Sun, “Green synthesis of silver nanoparticles with bagasse for colorimetric detection of cysteine in serum samples,” *J Alloys Compd*, vol. 686, pp. 82–89, 2016, doi: 10.1016/j.jallcom.2016.05.348.
- [413] Y. S. Borghei, M. Hosseini, M. Khoobi, and M. R. Ganjali, “Novel Fluorometric Assay for Detection of Cysteine as a Reducing Agent and Template in Formation of Copper Nanoclusters,” *J Fluoresc*, vol. 27, no. 2, pp. 529–536, 2017, doi: 10.1007/s10895-016-1980-3.
- [414] Y. Ding *et al.*, “Tuberculosis causes highly conserved metabolic changes in human patients, mycobacteria-infected mice and zebrafish larvae,” *Sci Rep*, vol. 10, no. 1, Dec. 2020, doi: 10.1038/s41598-020-68443-y.

- [415] M. Brenner *et al.*, “*Listeria monocytogenes* TcyKLMN cystine/cysteine transporter facilitates glutathione synthesis and virulence gene expression”, doi: 10.1101/2021.09.07.459368.
- [416] F. Ewann and P. S. Hoffman, “Cysteine metabolism in *Legionella pneumophila*: Characterization of an L-cystine-utilizing mutant,” *Appl Environ Microbiol*, vol. 72, no. 6, pp. 3993–4000, Jun. 2006, doi: 10.1128/AEM.00684-06.
- [417] L. Li and B. Li, “Sensitive and selective detection of cysteine using gold nanoparticles as colorimetric probes,” *Analyst*, vol. 134, no. 7, pp. 1361–1365, 2009, doi: 10.1039/b819842j.
- [418] K. Yin, F. Yu, W. Zhang, and L. Chen, “A near-infrared ratiometric fluorescent probe for cysteine detection over glutathione indicating mitochondrial oxidative stress in vivo,” *Biosens Bioelectron*, vol. 74, pp. 156–164, 2015, doi: 10.1016/j.bios.2015.06.039.
- [419] G. Chwatko and E. Bald, “Determination of cysteine in human plasma by high-performance liquid chromatography and ultraviolet detection after pre-column derivatization with 2-chloro-1-methylpyridinium iodide,” *Talanta*, vol. 52, no. 3, pp. 509–515, 2000, doi: 10.1016/S0039-9140(00)00394-5.
- [420] B. Han and E. Wang, “Oligonucleotide-stabilized fluorescent silver nanoclusters for sensitive detection of biothiols in biological fluids,” *Biosens Bioelectron*, vol. 26, no. 5, pp. 2585–2589, 2011, doi: 10.1016/j.bios.2010.11.011.
- [421] A. Küster, I. Tea, S. Sweeten, J. C. Rozé, R. J. Robins, and D. Darmaun, “Simultaneous determination of glutathione and cysteine concentrations and 2H enrichments in microvolumes of neonatal blood using gas chromatography-mass spectrometry,” *Anal Bioanal Chem*, vol. 390, no. 5, pp. 1403–1412, 2008, doi: 10.1007/s00216-007-1799-5.
- [422] E. C. Tsardaka, C. K. Zacharis, P. D. Tzanavaras, and A. Zotou, “Determination of glutathione in baker’s yeast by capillary electrophoresis using methyl propiolate as derivatizing reagent,” *J Chromatogr A*, vol. 1300, pp. 204–208, 2013, doi: 10.1016/j.chroma.2013.05.005.
- [423] J. M. Held *et al.*, “Targeted quantitation of site-specific cysteine oxidation in endogenous proteins using a differential alkylation and multiple reaction monitoring mass

- spectrometry approach,” *Molecular and Cellular Proteomics*, vol. 9, no. 7, pp. 1400–1410, 2010, doi: 10.1074/mcp.M900643-MCP200.
- [424] C. Xiao, J. Chen, B. Liu, X. Chu, L. Wu, and S. Yao, “Sensitive and selective electrochemical sensing of l-cysteine based on a caterpillar-like manganese dioxide-carbon nanocomposite,” *Physical Chemistry Chemical Physics*, vol. 13, no. 4, pp. 1568–1574, 2011, doi: 10.1039/c0cp00980f.
- [425] E. Abbasi *et al.*, “Silver nanoparticles: Synthesis methods, bio-applications and properties,” *Crit Rev Microbiol*, vol. 42, no. 2, pp. 173–180, 2016, doi: 10.3109/1040841X.2014.912200.
- [426] K. Midha, G. Singh, M. Nagpal, and S. Arora, “Potential application of silver nanoparticles in medicine,” *Nanoscience & Nanotechnology-Asia*, vol. 6, no. 2, pp. 82–91, 2017, doi: 10.2174/2210681205666150818230319.
- [427] F. Zhang, L. Zeng, Y. Zhang, H. Wang, and A. Wu, “A colorimetric assay method for Co²⁺ based on thioglycolic acid functionalized hexadecyl trimethyl ammonium bromide modified Au nanoparticles (NPs),” *Nanoscale*, vol. 3, no. 5, pp. 2150–2154, 2011, doi: 10.1039/c1nr10149h.
- [428] S. Chen, H. Gao, W. Shen, C. Lu, and Q. Yuan, “Colorimetric detection of cysteine using noncrosslinking aggregation of fluorosurfactant-capped silver nanoparticles,” *Sens Actuators B Chem*, vol. 190, pp. 673–678, 2014, doi: 10.1016/j.snb.2013.09.036.
- [429] K. E. Fong and L. Y. L. Yung, “Localized surface plasmon resonance: A unique property of plasmonic nanoparticles for nucleic acid detection,” *Nanoscale*, vol. 5, no. 24, pp. 12043–12071, 2013, doi: 10.1039/c3nr02257a.
- [430] Y. Xia, J. Ye, K. Tan, J. Wang, and G. Yang, “Colorimetric visualization of glucose at the submicromole level in serum by a homogenous silver nanoprism-glucose oxidase system,” *Anal Chem*, vol. 85, no. 13, pp. 6241–6247, 2013, doi: 10.1021/ac303591n.
- [431] C. Lu, Y. Zu, and V. W. W. Yam, “Nonionic surfactant-capped gold nanoparticles as postcolumn reagents for high-performance liquid chromatography assay of low-molecular-mass biothiols,” *J Chromatogr A*, vol. 1163, no. 1–2, pp. 328–332, 2007, doi: 10.1016/j.chroma.2007.07.045.

- [432] A. Simo, J. Polte, N. Pfänder, U. Vainio, F. Emmerling, and K. Rademann, "Formation mechanism of silver nanoparticles stabilized in glassy matrices," *J Am Chem Soc*, vol. 134, no. 45, pp. 18824–18833, 2012, doi: 10.1021/ja309034n.
- [433] S. Chernousova and M. Epple, "Silver as antibacterial agent: Ion, nanoparticle, and metal," *Angewandte Chemie - International Edition*, vol. 52, no. 6, pp. 1636–1653, 2013, doi: 10.1002/anie.201205923.
- [434] M. Safarpour *et al.*, "Ultrasound-assisted extraction of antimicrobial compounds from *Thymus daenensis* and *Silybum marianum*: Antimicrobial activity with and without the presence of natural silver nanoparticles," *Ultrason Sonochem*, vol. 42, pp. 76–83, 2018, doi: 10.1016/j.ultsonch.2017.11.001.
- [435] S. W. Ahmed *et al.*, "Synthesis and chemosensing of nitrofurazone using olive oil based silver nanoparticles (O-AgNPs)," *Sens Actuators B Chem*, vol. 256, pp. 429–439, 2018, doi: 10.1016/j.snb.2017.10.111.
- [436] W. Wang *et al.*, "The biological activities, chemical stability, metabolism and delivery systems of quercetin: A review," *Trends Food Sci Technol*, vol. 56, pp. 21–38, 2016, doi: 10.1016/j.tifs.2016.07.004.
- [437] M. Dueñas, S. González-Manzano, A. González-Paramás, and C. Santos-Buelga, "Antioxidant evaluation of O-methylated metabolites of catechin, epicatechin and quercetin," *J Pharm Biomed Anal*, vol. 51, no. 2, pp. 443–449, 2010, doi: 10.1016/j.jpba.2009.04.007.
- [438] S. C. Bischoff, "Quercetin: Potentials in the prevention and therapy of disease," *Curr Opin Clin Nutr Metab Care*, vol. 11, no. 6, pp. 733–740, 2008, doi: 10.1097/MCO.0b013e32831394b8.
- [439] D. Paramelle, A. Sadovoy, S. Gorelik, P. Free, J. Hobley, and D. G. Fernig, "A rapid method to estimate the concentration of citrate capped silver nanoparticles from UV-visible light spectra," *Analyst*, vol. 139, no. 19, pp. 4855–4861, 2014, doi: 10.1039/c4an00978a.

- [440] Y. Sun and Y. Xia, "Gold and silver nanoparticles: A class of chromophores with colors tunable in the range from 400 to 750 nm," *Analyst*, vol. 128, no. 6, pp. 686–691, 2003, doi: 10.1039/b212437h.
- [441] F. Tasca and R. Antiochia, "Biocide activity of green quercetin-mediated synthesized silver nanoparticles," *Nanomaterials*, vol. 10, no. 5, May 2020, doi: 10.3390/nano10050909.
- [442] L. Dian *et al.*, "Enhancing oral bioavailability of quercetin using novel soluplus polymeric micelles," *Nanoscale Res Lett*, vol. 9, no. 1, pp. 1–11, 2014, doi: 10.1186/1556-276X-9-684.
- [443] M. Catauro *et al.*, "Silica/quercetin sol-gel hybrids as antioxidant dental implant materials," *Sci Technol Adv Mater*, vol. 16, no. 3, 2015, doi: 10.1088/1468-6996/16/3/035001.
- [444] S. Jain and M. S. Mehata, "Medicinal plant leaf extract and pure flavonoid mediated green synthesis of silver nanoparticles and their enhanced antibacterial property," *Sci Rep*, vol. 7, no. 1, pp. 1–13, 2017, doi: 10.1038/s41598-017-15724-8.
- [445] U. K. Parashar *et al.*, "Study of mechanism of enhanced antibacterial activity by green synthesis of silver nanoparticles," *Nanotechnology*, vol. 22, no. 41, 2011, doi: 10.1088/0957-4484/22/41/415104.
- [446] V. Gopinath *et al.*, "Anti-Helicobacter pylori, cytotoxicity and catalytic activity of biosynthesized gold nanoparticles: Multifaceted application," *Arabian Journal of Chemistry*, vol. 12, no. 1, pp. 33–40, 2019, doi: 10.1016/j.arabjc.2016.02.005.
- [447] N. S. Jayamohan, P. K. P, and K. Jayachandra, "Surveillance of in vitro antioxidant and anthelmintic activity of methanolic extract of *Syzygium cumini* bark (Myrtaceae) * Correspondence Info :," *Ijpp*, vol. 3, no. 2, pp. 56–62, 2013, doi: 10.7439/ijpp.
- [448] K. Pekal, Anna Biesaga, Magdalena Pyrzynska, "Interaction of quercetin with copper ions: complexation, oxidation and reactivity towards radicals," *Biometals*, vol. 24, pp. 41–49, 2010.

- [449] S. O. Aisida *et al.*, “Biosynthesis of silver oxide nanoparticles using leave extract of *Telfairia Occidentalis* and its antibacterial activity,” *Mater Today Proc*, vol. 36, no. xxxx, pp. 208–213, 2019, doi: 10.1016/j.matpr.2020.03.005.
- [450] Á. I. López-Lorente and B. Mizaikoff, “Recent advances on the characterization of nanoparticles using infrared spectroscopy,” *TrAC - Trends in Analytical Chemistry*, vol. 84, pp. 97–106, 2016, doi: 10.1016/j.trac.2016.01.012.
- [451] S. Naqvi *et al.*, “Synthesis and characterization of maltol capped silver nanoparticles and their potential application as an antimicrobial agent and colorimetric sensor for cysteine,” *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 229, p. 118002, Mar. 2020, doi: 10.1016/J.SAA.2019.118002.
- [452] M. K. Trivedi and A. B. Dahryn Trivedi, “Spectroscopic characterization of disodium hydrogen orthophosphate and sodium nitrate after biofield treatment,” *J Chromatogr Sep Tech*, vol. 06, no. 05, 2015, doi: 10.4172/2157-7064.1000282.
- [453] K. Jyoti, M. Baunthiyal, and A. Singh, “Characterization of silver nanoparticles synthesized using *Urtica dioica* Linn. leaves and their synergistic effects with antibiotics ,” *J Radiat Res Appl Sci*, vol. 9, no. 3, pp. 217–227, 2016, doi: 10.1016/j.jrras.2015.10.002.
- [454] F. Zia, N. Ghafoor, M. Iqbal, and S. Mehboob, “Green synthesis and characterization of silver nanoparticles using *Cydonia oblong* seed extract,” *Applied Nanoscience (Switzerland)*, vol. 6, no. 7, pp. 1023–1029, 2016, doi: 10.1007/s13204-016-0517-z.
- [455] A. Bankar, B. Joshi, A. Ravi, and S. Zinjarde, “Banana peel extract mediated novel route for the synthesis of silver nanoparticles,” *Colloids Surf A Physicochem Eng Asp*, vol. 368, no. 1–3, pp. 58–63, 2010, doi: 10.1016/j.colsurfa.2010.07.024.
- [456] B. Kumar, K. Smita, L. Cumbal, and A. Debut, “Green synthesis of silver nanoparticles using Andean blackberry fruit extract,” *Saudi J Biol Sci*, vol. 24, no. 1, pp. 45–50, 2017, doi: 10.1016/j.sjbs.2015.09.006.
- [457] L.-O. Andersson, “Study of some silver-thiol complexes and polymers: Stoichiometry and optical effects,” *J Polym Sci A1*, vol. 10, no. 7, pp. 1963–1973, 1972, doi: 10.1002/pol.1972.150100707.

- [458] T. Toyo'oka, "Recent advances in separation and detection methods for thiol compounds in biological samples," *Journal of Chromatography B*, vol. 877, no. 28, pp. 3318–3330, Oct. 2009, doi: 10.1016/J.JCHROMB.2009.03.034.
- [459] S. Mohammadi and G. Khayatian, "Colorimetric detection of biothiols based on aggregation of chitosan-stabilized silver nanoparticles," *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 185, pp. 27–34, Oct. 2017, doi: 10.1016/J.SAA.2017.05.034.
- [460] K. Szot-Karpińska, A. Leśniewski, M. Jönsson-Niedziółka, F. Marken, and J. Niedziółka-Jönsson, "Electrodes modified with bacteriophages and carbon nanofibres for cysteine detection," *Sens Actuators B Chem*, vol. 287, no. October 2018, pp. 78–85, 2019, doi: 10.1016/j.snb.2019.01.148.
- [461] Y. Zhang *et al.*, "Colorimetric sensor for cysteine in human urine based on novel gold nanoparticles," *Talanta*, vol. 161, pp. 520–527, 2016, doi: 10.1016/j.talanta.2016.09.009.
- [462] J. Athilakshmi, M. Mohan, and D. K. Chand, "Selective detection of cysteine/cystine using silver nanoparticles," *Tetrahedron Lett*, vol. 54, no. 5, pp. 427–430, 2013, doi: 10.1016/j.tetlet.2012.11.050.
- [463] H. P. Borase *et al.*, "Bio-functionalized silver nanoparticles: a novel colorimetric probe for cysteine detection," *Appl Biochem Biotechnol*, vol. 175, no. 7, pp. 3479–3493, 2015, doi: 10.1007/s12010-015-1519-0.
- [464] D. Rithesh Raj and C. Sudarsanakumar, "Surface plasmon resonance based fiber optic sensor for the detection of cysteine using diosmin capped silver nanoparticles," *Sens Actuators A Phys*, vol. 253, pp. 41–48, 2017, doi: 10.1016/j.sna.2016.11.019.
- [465] C. Han, K. Xu, Q. Liu, X. Liu, and J. Li, "Colorimetric sensing of cysteine using label-free silver nanoparticles," *Sens Actuators B Chem*, vol. 202, pp. 574–582, 2014, doi: 10.1016/j.snb.2014.05.139.
- [466] S. Davidović *et al.*, "Dextran coated silver nanoparticles — Chemical sensor for selective cysteine detection," *Colloids Surf B Biointerfaces*, vol. 160, pp. 184–191, 2017, doi: 10.1016/j.colsurfb.2017.09.031.

- [467] J. T. Huang, X. X. Yang, Q. L. Zeng, and J. Wang, "A simple green route to prepare stable silver nanoparticles with pear juice and a new selective colorimetric method for detection of cysteine," *Analyst*, vol. 138, no. 18, pp. 5296–5302, 2013, doi: 10.1039/c3an00901g.
- [468] S. Babu, M. O. Claville, and K. Ghebreyessus, "Rapid synthesis of highly stable silver nanoparticles and its application for colourimetric sensing of cysteine," *J Exp Nanosci*, vol. 10, no. 16, pp. 1242–1255, 2015, doi: 10.1080/17458080.2014.994680.
- [469] Z. Xue, L. Xiong, H. Rao, X. Liu, and X. Lu, "A naked-eye liquid-phase colorimetric assay of simultaneous detect cysteine and lysine," *Dyes and Pigments*, vol. 160, no. July 2018, pp. 151–158, 2019, doi: 10.1016/j.dyepig.2018.07.054.
- [470] S. Liao *et al.*, "Novel S, N-doped carbon quantum dot-based 'off-on' fluorescent sensor for silver ion and cysteine," *Talanta*, vol. 180, pp. 300–308, 2018, doi: 10.1016/j.talanta.2017.12.040.
- [471] S. Zhang, B. Lin, Y. Yu, Y. Cao, M. Guo, and L. Shui, "A ratiometric nanoprobe based on silver nanoclusters and carbon dots for the fluorescent detection of biothiols," *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 195, pp. 230–235, 2018, doi: 10.1016/j.saa.2018.01.078.
- [472] I. Sanskriti and K. K. Upadhyay, "Facile designing of a colorimetric plasmonic gold nanosensor for selective detection of cysteine over other biothiols," *ChemistrySelect*, vol. 2, no. 34, pp. 11200–11205, 2017, doi: 10.1002/slct.201702288.
- [473] K. Güçlü, M. Özyürek, N. Güngör, S. Baki, and R. Apak, "Selective optical sensing of biothiols with Ellman's reagent: 5,5'-Dithio-bis(2-nitrobenzoic acid)-modified gold nanoparticles," *Anal Chim Acta*, vol. 794, pp. 90–98, 2013, doi: 10.1016/j.aca.2013.07.041.
- [474] T. Feng, Y. Chen, B. Feng, J. Yan, and J. Di, "Fluorescence red-shift of gold-silver nanoclusters upon interaction with cysteine and its application," *Spectrochim Acta A Mol Biomol Spectrosc*, vol. 206, pp. 97–103, 2019, doi: 10.1016/j.saa.2018.07.087.

- [475] K. H. Thompson and C. Orvig, "Coordination chemistry of vanadium in metallo pharmaceutical candidate compounds," *Coord Chem Rev*, vol. 219–221, pp. 1033–1053, 2001, doi: 10.1016/S0010-8545(01)00395-2.
- [476] L. Wang, S. Zhuo, H. Tang, and D. Cao, "An efficient fluorescent probe for rapid sensing of different concentration ranges of cysteine with two-stage ratiometric signals," *Dyes and Pigments*, vol. 157, pp. 284–289, 2018, doi: 10.1016/j.dyepig.2018.05.004.
- [477] T. X. Zhang, H. J. Liu, and Y. Chen, "Ultrabright gold-silver bimetallic nanoclusters: synthesis and their potential application in cysteine sensing," *Colloids Surf A Physicochem Eng Asp*, vol. 555, pp. 572–579, 2018, doi: 10.1016/j.colsurfa.2018.07.038.
- [478] Y. Chen, T. Chen, X. Wu, and G. Yang, "CuMnO₂ nanoflakes as pH-switchable catalysts with multiple enzyme-like activities for cysteine detection," *Sens Actuators B Chem*, vol. 279, pp. 374–384, 2019, doi: 10.1016/j.snb.2018.09.120.
- [479] H. Liu *et al.*, "High performance fluorescence biosensing of cysteine in human serum with superior specificity based on carbon dots and cobalt-derived recognition," *Sens Actuators B Chem*, vol. 280, no. October 2018, pp. 62–68, 2019, doi: 10.1016/j.snb.2018.10.029.