frontiers | Frontiers in Bioengineering and Biotechnology

TYPE Original Research
PUBLISHED 19 April 2023
DOI 10.3389/fbioe.2023.1177981

OPEN ACCESS

EDITED BY
Kumaran Subramanian,
Sathyabama Institute of Science and Technology, India

REVIEWED BY
Chita Ranjan Sahoo,
Siksha O Anusandhan University, India
Ruhul Amin,
Assam Down Town University, India
Waseem Mushtaq,
Aligarh Muslim University, India

*CORRESPONDENCE
Arpita Roy,
arbt2014@gmail.com
Arun Bhagare,
arunbhagare@gmail.com
Byong-Hun Jeon,
bhjeon@hanyang.ac.kr

RECEIVED 02 March 2023
ACCEPTED 03 April 2023
PUBLISHED 19 April 2023

CITATION
Walunj P, Roy A, Jadhav V, Athare P, Dhaygude A, Aher J, Algethami JS, Lokhande D, Alqahtani MS, Bhagare A, Alghamdi S, Eltayeb LB, Al-Moraya IS, Yadav KK, Ahn Y and Jeon B-H (2023), Polyol-mediated zinc oxide nanoparticles using the refluxing method as an efficient photocatalytic and antimicrobial agent.
Front. Bioeng. Biotechnol. 11:1177981.
doi: 10.3389/fbioe.2023.1177981

Polyol-mediated zinc oxide nanoparticles using the refluxing method as an efficient photocatalytic and antimicrobial agent

Payal Walunj[1], Arpita Roy[2]*, Vikram Jadhav[1], Pragati Athare[1], Akshay Dhaygude[1], Jayraj Aher[3], Jari S. Algethami[4,5], Dnyaneshwar Lokhande[6], Mohammed S. Alqahtani[7,8], Arun Bhagare[1]*, Saad Alghamdi[9], Lienda Bashier Eltayeb[10], Issa Saad Al-Moraya[11], Krishna Kumar Yadav[12,13], Yongtae Ahn[14] and Byong-Hun Jeon[14]*

[1]M. V. P. Samaj's K. K. Wagh Arts, Science, and Commerce College, Pimpalgaon (B.), Nashik, India, [2]Department of Biotechnology, Sharda School of Engineering and Technology, Sharda University, Greater Noida, India, [3]Department of Chemistry, K. R. T. Arts, B. H. Commerce, and A. M. Science College, Nashik, India, [4]Department of Chemistry, College of Science and Arts, Najran University, Najran, Saudi Arabia, [5]Promising Centre for Sensors and Electronic Devices (PCSED), Najran University, Najran, Saudi Arabia, [6]Department of Chemistry, M.V.P. Samaj's K.P.G. Arts, Science, and Commerce College, Igatpuri, Nashik, India, [7]Radiological Sciences Department, College of Applied Medical Sciences, King Khalid University, Abha, Saudi Arabia, [8]BioImaging Unit, Space Research Centre, University of Leicester, Leicester, United Kingdom, [9]Laboratory Medicine Department, Faculty of Applied Medical Sciences, Umm Al-Qura University, Makkah, Saudi Arabia, [10]Department of Medical Laboratory Sciences, College of Applied Medical Sciences, Prince Sattam Bin AbdulAziz University- Al-Kharj, Riyadh, Saudi Arabia, [11]Forensic Medicine Center, Ministry of Health, Saudi Arabia, [12]Faculty of Science and Technology, Madhyanchal Professional University, Bhopal, India, [13]Environmental and Atmospheric Sciences Research Group, Scientific Research Center, Al-Ayen University, Thi-Qar, Iraq, [14]Department of Earth Resources and Environmental Engineering, Hanyang University, Seoul, Republic of Korea

Nanomaterials have attracted more curiosity recently because of their wide-ranging application in environmental remediation and electronic devices. The current study focuses on zinc oxide nanoparticles' (ZnO NPs) simple production, characterization, and applications in several fields, including medicinal and photocatalytic degradation of dyes. The non-aqueous-based reflux method is helpful for ZnO NP synthesis; the procedure involves refluxing zinc acetate dihydrate precursor in ethylene glycol for 3 hours in the absence of sodium acetate, in which the refluxing rate and the cooling rate are optimized to get the desired phase, and the unique morphology of polyol-mediated ZnO NPs; it has been achieved using the capping agent TBAB (tetra-butyl ammonium bromide) and precursor zinc acetate dihydrate. UV–Vis, FTIR, XRD, and FESEM structurally characterized polyol-mediated ZnO-NPs. The results show that the material is pure and broadly aggregated into spherical nanoparticles with an average particle size of 18.09 nm. According to XRD analysis, heat annealing made the crystallites more prominent and favored a monocrystalline state. These results and the low cost of making polyol-mediated ZnO NPs demonstrate photocatalytic and antimicrobial properties.