World Academy of Science, Engineering and Technology
International Journal of Chemical and Molecular Engineering
Vol:16, No:11, 2022

Controlled Size Synthesis of ZnO and PEG-ZnO NPs and Their Biological Evaluation

Authors : Mahnoor Khan, Bashir Ahmad, Khizar Hayat, Saad Ahmad Khan, Laiba Ahmad, Shumaila Bashir, Abid Ali Khan

Abstract : The objective of this study was to synthesize the smallest possible size of ZnO NPs using a modified wet chemical synthesis method and to prepare core shell using polyethylene glycol (PEG) as shell material. Advanced and sophisticated techniques were used to confirm the synthesis, size, and shape of these NPs. Rounded, clustered NPs of size 5.343 nm were formed. Both the plain and core shell NPs were tested against MDR bacteria (E. cloacae, E. amnigenus, Shigella, S. odorifacae, Citrobacter, and E. coli). Both of the NPs showed excellent antibacterial properties, whereas E. cloacae showed maximum zone of inhibition of 16 mm, 27 mm, and 32 mm for 500 µg/ml, 1000 µg/ml, and 1500 µg/ml, respectively for plain ZnO NPs and 18 mm, 28 mm and 35 mm for 500 µg/ml, 1000 µg/ml and 1500 µg/ml for core shell NPs. These NPs were also biocompatible on human red blood cells showing little hemolysis of only 4% for 70 µg/ml for plain NPs and 1.5% for 70 µg/ml for core shell NPs. Core shell NPs were highly biocompatible because of the PEG. Their therapeutic effect as photosensitizers in photodynamic therapy (PDT) for cancer treatment was also monitored. The cytotoxicity of ZnO and PEG-ZnO was evaluated using MTT assay. Our results demonstrated that these NPs could generate ROS inside tumor cells after irradiation which in turn initiates an apoptotic pathway leading to cell death hence proving to be an effective candidate for PDT.

Keywords : ZnO, hemolysis, cytotoxiciy assay, photodynamic therapy, antibacterial
Conference Title : ICMSPC 2022 : International Conference on Materials Synthesis and Physical Chemistry
Conference Location : San Francisco, United States
Conference Dates : November 03-04, 2022