

Abstract

Zinc Oxide (ZnO) films were deposited on a glass substrate using the spray pyrolysis method. The as-deposited films were doped with 1% cobalt (Co), 1% manganese (Mn), and 0.5% Co/Mn. The impact of doping on the structural, morphological, optical, and wettability properties of the films was investigated. Additionally, these films were also studied for their antibacterial activity. Various techniques, including X-ray diffraction (XRD), atomic force microscopy (AFM), UV-visible spectroscopy, the Sessile Drop Method, and the Disc Diffusion Method, were used to characterize the deposited films. The XRD results revealed c-axis-oriented ZnO films. Doping with 1% Co and 1% Mn slightly improved the crystallinity of the ZnO. Surface roughness of the film was increased with Co and Co/Mn doping but decreased with Mn doping. UV-vis spectroscopy showed high transmission values (around 85%) for all the films in the visible region. The band gap of ZnO was increased due to doping, with values ranging from 3.24 to 3.29 eV except 1% Mn doping. Wettability tests of ZnO films indicated a shift from hydrophilic to hydrophobic behavior due to the doping. The antibacterial tests revealed a significant improvement in antibacterial activity (against both Gram-positive and Gram-negative bacteria), especially in the Co and Co/Mn doped samples.