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Morphological Characterization of RF Magnetron Sputtered Zinc Oxide Thin Films - Laser Assisted

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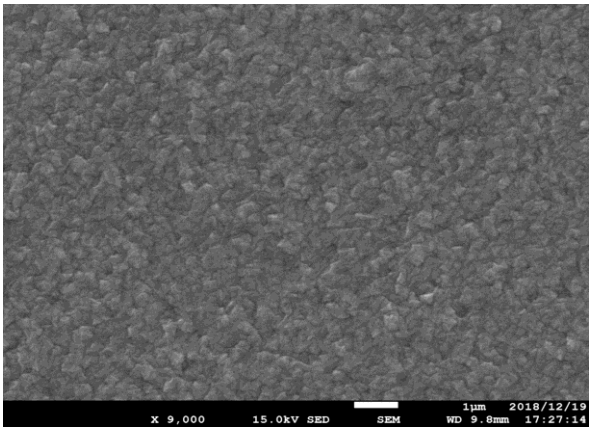
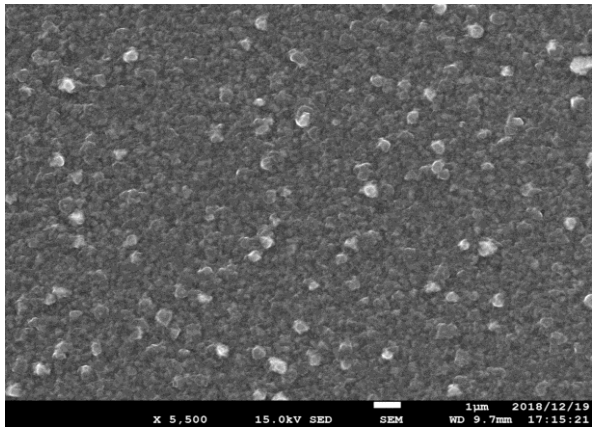
Among the many fabrication techniques of Zinc oxide (ZnO) thin films, the radio frequency (RF) magnetron sputtering method is industrially adopted for deposition of homogeneous ZnO films on large areas due to advantages such as, better reproducibility, high stability, good adhesion to substrate, high deposition rates and easy control of the composition of the films, compared to the other techniques [1]. Laser irradiation technique is used on thin films as an efficient method to improve the crystalline quality and increase the electron donors. Laser irradiation has several advantages, including fast crystallization at room temperature, possibility of local crystallization, crystallization of thin films on low melting point substrates, and increasing charge carriers through a photoconductivity effect [2].

In this study, ZnO thin films were deposited on sapphire substrates by (RF) magnetron sputtering technique using pure ZnO target of dimension 50ϕ x5t mm^2. The effects of laser irradiation on the morphological properties of the ZnO-based thin films were investigated.

The surface morphologies and compositions of the ZnO thin films were analyzed using scanning electron microscopy. The micro structural parameters, such as the particle number density and crystallite average diameter were calculated as 0.519 [/μm^2] and 0.511±0.128 [μm] respectively. Variation in the surface morphology of the thin films due to laser irradiation were observed. The surface morphological features of the laser irradiated films revealed the presence of crystalline grain size.



(a) Without laser irradiation



(b) With laser irradiation.

Figure 1. SEM Micrographs:

References

[1] Anil Kumar et al. // International Journal of Engineering Sciences & Research Technology, 5(8): August, 2016.

[2] S. Zhao, Y. Hua, R. Chen, J. Zhang, and P. Ji // Journal of Nanotechnology, Volume 2016, Article ID 9385725.