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Effect of Ag-doping on the properties of ZnO thin films for UV stimulated emission

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To attain UV stimulated emission, pure and Ag doped ZnO thin films were prepared by sol-gel spin coating process. Different preparation parameters were studied during fabrication, including precursor concentrations, aging time of solutions before deposition, number of layers, baking temperature and time, and annealing treatment conditions. Structural and morphological properties were studied by XRD and SEM measurements. XRD results showed that all the films are poly-crystalline with hexagonal wurtzite structure. SEM images revealed better homogeneity of Ag:ZnO films than pure films, with typical film thickness for all films of $\sim 2.6 \mu\text{m}$. Photoluminescence measurements were done for all samples, which demonstrated the stimulated emission characteristics from pure and Ag doped ZnO films with doping concentration higher than 0.01M, with threshold pump intensities of $\sim 23 \text{ MW.cm}^{-2}$ and 18 MW.cm^{-2} for pure and doped thin films, respectively. The output-input relation for these samples showed a kink positioned at the mentioned threshold intensities. The stimulated emission mechanism and the role of Ag doping in the stimulated emission process were discussed.

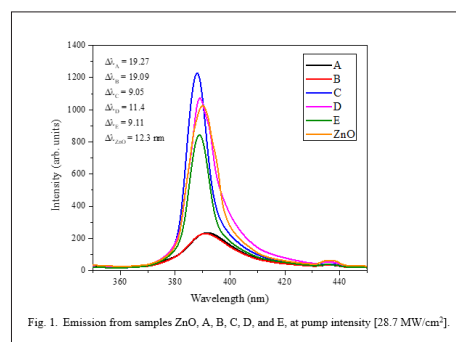


Fig. 1. Emission from samples ZnO, A, B, C, D, and E, at pump intensity $[28.7 \text{ MW/cm}^2]$.

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Recent Publications

1. Ahmed S Razeen, A S Gadallah and M M El-Nahass (2017), "Ultraviolet Stimulated Emission from Sol-Gel Spin Coated ZnO Thin Films". *Advances in Materials Science and Engineering*; 2017: 1-7. Doi: 10.1155/2017/9464862
2. Ahmed S Razeen, A S Gadallah and M M El-Nahass (2018), "Effect of Ag doping on the properties of ZnO thin films for UV stimulated emission". *Physica B: Condensed Matter*; 538:131. Doi: 10.1016/j.physb.2018.03.015.

Biography

Ahmed S Razeen is a Teaching Assistant at the National Institute of Laser Enhanced Sciences (NILES), Cairo University. He had completed his MSc research in thin film fabrication focusing on the stimulated emission properties of ZnO thin films. He is interested in fabrication and characterization of new optical materials.

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