

The modification of refractive index by using solid state diffusion

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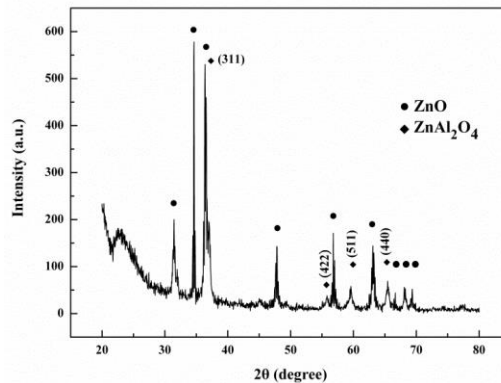
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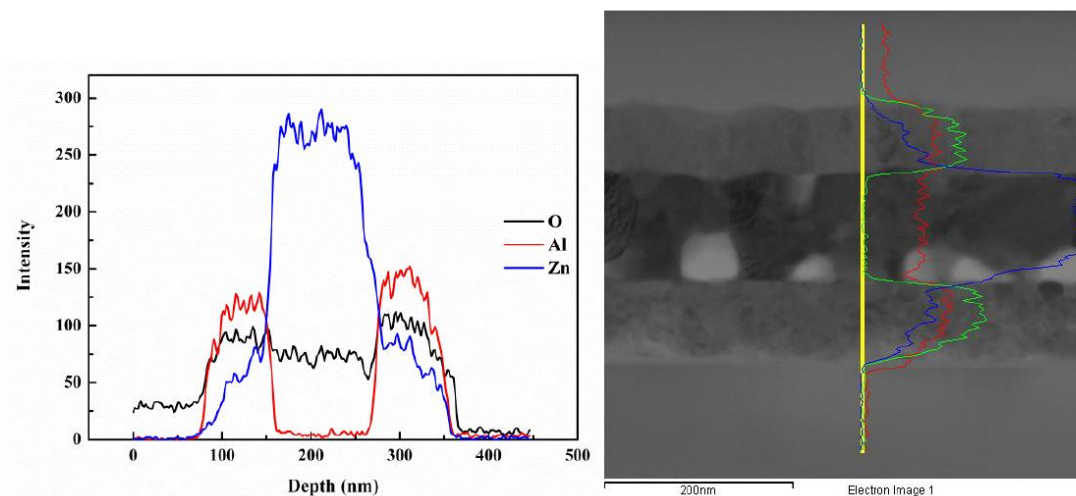
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Abstract: The optical coatings with excellence performance would be achieved more easily when the materials chosen have relatively adjustable refractive index. In this study, $\text{Al}_2\text{O}_3/\text{ZnO}/\text{Al}_2\text{O}_3$ structures were fabricated using electron beam evaporation and 800°C post-annealing treatments were carried out. According to the inter-diffusion, the ZnO layer became a high refractive index material with porous structure and the ZnAl_2O_4 spinel was formed as low refractive index material and the refractive index contrast of the multilayer was increased. In the $\text{Al}_2\text{O}_3/\text{ZnO}/\text{Al}_2\text{O}_3$ structure, the porous ZnO layer with an average porosity of 19.78% was successfully prepared and the refractive index was from 2 reduced to 1.357 by 800°C post-annealing process due to solid state diffusion mechanism.



The XRD of Al_2O_3 , ZnO and $\text{Al}_2\text{O}_3/\text{ZnO}/\text{Al}_2\text{O}_3$ thin films after an 800°C annealing process for 4 hours



TEM & EDS line scan