THIN FILM ZRO_2: EU_3+ CHARACTERIZATION OBTAINED BY ATOMIC LAYER DEPOSITION METHOD

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Abstract

Zirconium dioxide is extensively studied as a prospective material due to its excellent mechanical, thermal and optical properties. Zirconium oxide is a very stable material with melting point as high as 2710 °C, i.e., it can be stable even at high temperature. Moreover, this material is characterized by a high hardness and mechanical strength, good dielectric properties, low thermal conductivity, chemical stability and high refractive index. ZrO_2 is also biocompatible material and thus can be used in biology, medicine and dentistry for implants, etc. ZnO:Al thin films can be used as transparent contacts to GaN-based optoelectronics devices. The problem is sensitivity of ZnO to environment effects. To solve this limitation we coat ZnO with ZrO_2 films. These films can also convert light if dopad by rare earth ions. We thus test also possibility of activating them with europium (also with other RE ions).In our studies we tested ZrO_2:Eu multilayer structure as an active layers, which can convert short wave emission (eg UV emission) to light in the visible range. This can be an effective method to achieve the white-light emission. Characterized layers can also be optically active in the infrared spectral range of the absorbed light, which will allow to convert infrared to visible light. Thus such layers can be candidate for use in photovoltaic structures. The zirconium dioxide films and RE doped ZrO_2 thin films are obtained by the Atomic Layer Deposition method. Films deposited at low temperature (well below 240 °C) are investigated.

Keywords: Atomic layer deposition, thin films, zirconium dioxide

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