FABRICATION OF A MIS STRUCTURE BASED ON TWO-DIMENSIONAL ZnO NANOSTRUCTURES GROWN BY CHEMICAL ROUTES: ELECTROCHEMISTRY AND HYDROTERMAL
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Because of its physical properties, ZnO is considered a potential semiconductor compound for fabricating electronic and optoelectronic devices. In this regard, several growth techniques have been developed to ensure the required control for manufacturing commercial devices based in this material. On the pathway for improving the performance of the current devices, low-dimensional ZnO structures seem to be a promising alternative. Here, we report the fabrication of a metal-insulator-semiconductor (MIS) structure based on ZnO nanostructures grown on the surface of an anodized aluminum substrate by chemical routes: electrochemistry and hydrotermal. While the ZnO nanostructures were obtained through a low-temperature hydrothermal route, the Al₂O₃/Al substrate was obtained by electropolishing and subsequent anodizing of aluminum foil. The obtained ZnO/Al₂O₃/Al architecture was studied by x-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive spectroscopy X-ray (EDS), micro-Raman spectroscopy (µRS), cathodoluminescence (CL) and electrical measurements. The SEM analysis reveals that a nanostructured layer is grown on the anodized substrate, constituted by interconnected leaf-like ZnO nanostructures with average thickness of ~ 100 nm. According with the Raman spectrum, these ZnO nanostructures are well-crystalline. The formation of a MIS structure was observed using focus ion beam technology (FIB). The EDS analysis suggests the presence of ZnO, Al₂O₃ and Al phase; formation of these phases was confirmed definitly by XRD. The cathodoluminescence emission behaviours of the ZnO nanostructures are presented. Finally, the characteristic response of a metal-oxide-semiconductor junction is observed in the acquired curves I-V and C-V of the obtained structure, demonstrating that it is possible to fabricate a MIS heterojunctions based on ZnO nanostructures using chemical routes.

Keywords: Metal-Insulator-Semiconductor, ZnO nanostructures, chemical routes

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