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NANODEVICES BASED ON $A_{II}B_{VI}$ SEMICONDUCTING OXIDE NANOWIRE

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Due to the necessity of decarbonization, hydrogen has an important role as the replacement of fossil fuels in the energy sector and other industries. Unfortunately, hydrogen has proprieties that make it dangerous. Choosing material as sensor is an important part for fabrication of fast and reliable devices, capable of detecting dangerous gases. ZnO is one of the most promising and used material in sensing applications, due to its proprieties, but has drawbacks like poor selectivity, high operating temperature, etc. [1]. These drawbacks can be improved by doping with rare-earth materials, like Eu, which can lead to a higher response and lower operating temperature [2]. Another method of improving sensing proprieties is by using 1D material, instead of 2D [3].

In our work, we present an improved sensing performance of a device based on a single ZnO:Eu_2O_3 nanowire, compared to ZnO:Eu_2O_3 films. ZnO:Eu_2O_3 nanowire arrays were grown using electrochemical deposition method, and single nanowire was integrated using FIB/SEM. Morphology was studied using SEM, observing uniform deposition with nanowires with similar size. Structural proprieties were studied using XRD, observing presence of ZnO and Eu_2O_3 peaks. Device based on a single ZnO:Eu_2O_3 nanowire was tested to a series of gases at different operating temperatures, observing selectivity to 100 ppm hydrogen, an improved response value and lower operating temperature compared to non-doped ZnO and ZnO:Eu_2O_3 films. These results show that by using a single nanowire as sensing material and modifying $A_{II}B_{VI}$ semiconducting oxide proprieties by doping with different metals, we can obtain an improved sensing performance.

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