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# Low temperature preparation of Ag-doped ZnO nanowire arrays for sensor and light-emitting diode applications

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## Abstract

Transition metal doped-oxide semiconductor nanostructures are important to achieve enhanced and new properties for advanced applications. We describe the low temperature preparation of ZnO:Ag nanowire/nanorod (NW/NR) arrays by electrodeposition at 90 °C. The NWs have been characterized by SEM, EDX, transmittance and photoluminescence (PL) measurements. The integration of Ag in the crystal is shown. Single nanowire/nanorod of ZnO:Ag was integrated in a nanosensor structure leading to new and enhanced properties. The ultraviolet (UV) response of the nanosensor was investigated at room temperature. Experimental results indicate that ZnO:Ag (0.75 μM) nanosensor possesses faster response/recovery time and better response to UV light than those reported in literature. The sensor structure has been also shown to give a fast response for the hydrogen detection with improved performances compared to pristine ZnO NWs. ZnO:Ag nanowire/nanorod arrays electrochemically grown on p-type GaN single crystal layer is also shown to act as light emitter in LED structures. The emission wavelength is red-shifted compared to pristine ZnO NW array. At low Ag concentration a single UV-blue emission is found whereas at higher concentration of dopant the emission is broadened and extends up to the red wavelength range. Our study indicates that high quality ZnO:Ag NW/NR prepared at low temperature by electrodeposition can serve as building nanomaterials for new sensors and light emitting diodes (LEDs) structures with low-power consumption.