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Unusual application of aluminium-doped ZnO thin film developed by metalorganic chemical vapour deposition for surface temperature sensor

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Abstract

A relatively new promising method for surface temperature measurement is the use of thermographic phosphors. For this purpose, the temperature-dependent photoluminescence (PL) properties of aluminium-doped ZnO thin films were studied. The films have been successfully deposited on substrate of Si(100)-orientation by metalorganic chemical vapour deposition (MOCVD) method. For the use of the films as temperature sensors, the Photoluminescence (PL) properties are most important. Consequently, the emission peaks are observed in the undoped and Al-doped films deposited at 550°C and annealed at 900°C for 2 h after ultraviolet laser excitation (355 nm). The results show that with increasing temperature the PL intensity is quenched for the Al-doped ZnO film (n(Al)/n(Zn)= 0.051). As a result, the area under the spectrum changes significantly with temperature, making it useful for temperature evaluation. Al-doped ZnO films can be used as temperature sensors within the range of room temperature to 300°C. Beyond this range the spectrum is no longer sensitive to temperature change.

Keywords: *MOCVD, Al-doped ZnO, Phosphorescence, Surface temperature measurement, thermographic Phosphor.*

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