스퍼터링 법으로 증착한 CdS 박막의 광전도도 특성 평가

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Abstract : Applications of CdS films in this study are to exhibit a high conductivity when they are exposed at light with visible wavelength and sequentially to show a low conductivity in dark state. For this purpose, CdS films should have a high photosensitivity, still maintaining a high conductivity at a visible light. In this study, CdS films were prepared at room temperature on glass substrates by rf magnetron sputtering. In order to increase the photo-conductivity in visible light, various defect levels should be located within the CdS band gap. In order to nucleate the defect sites within the CdS band gap, CdS films were deposited on glass substrates at room temperature using various $H_2/(Ar+H_2)$ flow ratios by an rf magnetron sputtering. Through the investigation of the structural and photoconductive properties of CdS films by an addition of hydrogen, the relationship between photo- and dark-resistance in CdS films was investigated in detail.

200-nm-thick CdS films for photoconductive sensor applications were prepared at various $H_2/(Ar+H_2)$ flow ratios on glass substrates at room temperature by rf magnetron sputtering. Sulfur concentration in CdS films crystallized at room temperature with (002) preferred orientation depends directly on the hydrogen atmosphere and the surface roughness of the films gradually increases with increasing hydrogen atmosphere. Films deposited at 8% of $H_2/(Ar+H_2)$ exhibit an abrupt decrease of dark- and photo-resistance, showing a low photo-sensitivity (R_{dark}/R_{photo}). Onthe other hand, films deposited at a hydrogen atmosphere of 42% exhibit a photo-sensitivity of 5×10^3, maintaining a photo-resistance of an approximately 2×10^4 Ω/square. The dark- and photo-resistance values of CdS films were related with a composition, surface roughness, and defect sites within the band gap.

Key Words : CdS, Photo-conductivity, Photoconductive sensor