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REACTIVE SPUTTERING GROWTH OF INDIUM NITRIDE THIN FILMS ON FLEXIBLE SUBSTRATE UNDER DIFFERENT SUBSTRATE TEMPERATURES

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ABSTRACT- Indium nitride (InN) thin films were deposited on kapton polyimide substrate by using reactive gas-timing radio frequency (RF) sputtering technique. An indium target with purity of 99.999% was used. Throughout this work, the RF power and gas ratio of argon and nitrogen were maintained at 60 W and 40:60 ($Ar:N_2$), respectively. The substrate temperature was varied from room temperature to 300°C. The surface morphology, structural and electrical properties of the deposited thin films as a function of the substrate temperature were investigated. All the deposited InN thin films have wurtzite crystal structure with preferred orientation along the (101) direction. The InN (101) peak becomes stronger and sharper as the substrate temperature increases from 100°C to 300°C. In addition, the packing density of the grains increases as the substrate temperature increases. The deposited InN films exhibit n-type conductivity behaviour and its Hall mobility increases from 720 cm^2/V-s to 2670 cm^2/V-s as the substrate temperature increases from room temperature to 300°C. These results imply that nucleation and crystal growth as well as the crystalline quality were improved at higher substrate temperatures. All the results lead to conclude that the optimal substrate temperature for the deposition of InN was 300°C.

Keywords: indium nitride, flexible substrate, radio frequency sputtering, reactive gas-timing.