

Enhancement of Hydrophobicity of Thermally Evaporated Bi Thin Films by Oblique Angle Deposition

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Abstract : Surface-dependent properties such as hydrophobicity can be modified significantly by oblique angle deposition technique. Bi thin films were studied for their hydrophobic nature. The effects of oblique angle deposition on structural, surface morphology, electrical and wettability properties of Bi thin films have been studied and a comparison of these physical properties of normally deposited and obliquely deposited Bi films has been carried out in this study. X-ray diffraction studies found that films have highly oriented hexagonal crystal structure and crystallite size is smaller for obliquely deposited (70 nm) film as compared to that of the normally deposited film (111 nm). Raman spectra of the films consist of peaks corresponding to E_g and A_{1g} first-order Raman modes of bismuth. The atomic force and scanning electron microscopy studies show that the surface roughness of obliquely deposited film is higher as compared to that of normally deposited film. Contact angle measurements revealed that both films are strongly hydrophobic in nature with the contact angles of 105° and 119° for normally and obliquely deposited films respectively. Oblique angle deposition enhances the hydrophobicity of the film. The electrical conductivity of the film is significantly reduced by oblique angle deposition. The activation energies for electrical conduction were determined by four-probe measurements and are 0.016 eV and 0.018 eV for normally and obliquely deposited films respectively.

Keywords : bi thin films, hydrophobicity, oblique angle deposition, surface morphology

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