

ABSTRACT**Transport, Mechanical and Optical Properties
of Multilayer Films****Kanaka Durga Nallamshetty**

The transport, mechanical and optical properties of several multilayer systems such as Cu/Mn, Cu/Cr, Mn/SiO, Al₂O₃/Cu/Al₂O₃ and CeO₂/Cu/CeO₂ and optical properties of single metallic films of Mn and Cu are reported.

The bilayer wavelength dependence of resistivity and TCR of Cu/Mn and Cu/Cr multilayer films with different number of double layers from 5 to 45 is reported for parallel and perpendicular conduction in the temperature range 12 K - 484 K. The change in sign of in-plane TCR from negative to positive is observed as the bilayer wavelength is increased. However, the perpendicular TCR is found to be positive for all the series of films. The dependence of the room temperature resistivity, TCR, Young's modulus and reflectance on the bilayer wavelength exhibits oscillatory behaviour for $\Lambda \leq 11$ nm. The experimental results are analysed in the light of existing theories.

The spectral selectivity of Mn/SiO multilayer films in the thickness range 80 to 151 nm is reported in the wavelength range 320 to 900 nm for near normal

incidence of light. Increase in reflectance and decrease in absorbance are observed on annealing these films. The annealed Mn/SiO film of thickness 151 nm shows very high reflectance ($> 90\%$) and minimum absorbance over a narrow wavelength range (652 to 752 nm). The dependence of refractive index on the wavelength and thickness is reported for these films.

The optical properties of $\text{Al}_2\text{O}_3/\text{Cu}/\text{Al}_2\text{O}_3$ and $\text{CeO}_2/\text{Cu}/\text{CeO}_2$ multilayer films are reported for different angles of incidence of light in the wavelength range 900-190 nm. These films exhibit high reflectance ($> 90\%$) in the near infrared region (900 to 800 nm) and high visible transmittance ($\approx 48\%$). The annealed films exhibit greater reflectance compared to unannealed films, and tend to be more stable on exposure to atmospheric conditions. The effect of deposition parameters on the optical properties of these films is reported.

The optical properties of manganese and copper films are reported in the wavelength range 190-900 nm for near normal incidence of light. The effects of annealing and deposition parameters such as pressure, substrate and substrate temperature are also reported.