

Abstract Submitted  
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**Measurement of Optical, Mechanical and Transport properties of the hexagonal closed packed 4H polytype of metallic silver** INDRANI CHAKRABORTY, Tata Institute of Fundamental Research, Mumbai, India, SHARMILA N. SHIRODKAR, JNCASR, Bangalore, India, SMITA GOHIL, Tata Institute of Fundamental Research, Mumbai, India, UMESH WAGHMARE, JNCASR, Bangalore, India, PUSHAN AYYUB, Tata Institute of Fundamental Research, Mumbai, India — Optical, mechanical and transport property measurements were done on the hexagonal closed packed (hcp) 4H polytype of Ag with stacking sequence ABCBABC<sub>B</sub>.. grown as bulk films on  $Al_2O_3$  substrates. Diffused reflectance measurements done on the 4H films showed a general loss of reflectivity amounting to a decrease of 35% as compared to normal fcc (3C) Ag near 500 nm with a blueshift of 5nm in the bulk plasmon frequency, possibly due to the modified electronic structure of the hcp form. Raman spectroscopic measurements showed the appearance of a peak at  $64.3\text{ cm}^{-1}$  at 4K which underwent “Mode softening,” that is shifted to lower wave numbers with increase of temperature and disappeared above 350K. Low temperature transport measurements done on 4H films gave the in-plane resistivity value to be 39 times higher than that of a similarly synthesized fcc Ag film at 295 K. Vicker’s microhardness measurements done on the 4H films showed that the 4H samples to be almost 5 times harder than the 3C Ag. Density functional theory simulations were done to obtain the phonon dispersion, band structure and nature of Fermi surface for the 4H Ag which corroborated with the experimental observations. The 4H form appears to be a much less metallic, darker and harder form of Ag.

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