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Electrical transport mechanism studies of amorphous Ge2Sb2Te5 films at nm scales WENJIAN LU, CHANJONG JU, KOOKRIN CHAR, Center for Strongly Correlated Materials Research, Department of Physics and Astronomy, Seoul National University, Seoul 151-742, Korea — We fabricated the amorphous $Ge_2Sb_2Te_5$ (GST) films with different thicknesses ranging 10-100 nm by dc magnetron sputtering in trilayer geometry using metal top and bottom electrodes. Temperature and voltage bias dependent measurements of the electrical conductance have been employed to study the transport mechanism of the amorphous GST films at different length scale. At low temperatures, the electrical transport is dominated by the inelastic hopping through directed chains of localized states. With increasing temperature and length the variable range hopping (VRH) conductivity is induced, which is associated with the diffusive regime. At high temperatures, a thermally activated process is observed. The estimated values for the activation energy E_α and the carrier density n are 0.42 eV and 10^{18} cm^{-3}, respectively. When compared with the typical amorphous silicon, the amorphous GST seems to exhibit much larger localization length, which results in the difficulty of reaching the bulk limit even for the 100 nm thick GST film.

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