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Optical and Electronic Properties of Ge-Sb-Te films[1] HENG LI, University of Utah, P. C. TAYLOR, Colorado School of Mines — Amorphous and crystalline films in the system Ge-Sb-Te are of interest because of their use in reversible phase change optical storage media or electrical switches. These applications utilize differences in optical or electrical properties between the crystalline and amorphous phases of the same material. The most commonly employed composition is $Ge_2Sb_2Te_5$, which lies along the pseudobinary tie line GeTe-Sb_2Te_3. We present data on amorphous films of GeTe, Sb_2Te_3, $Ge_2Sb_2Te_5$, and $Ge_2Sb_2Te_7$ grown by rf sputtering and examine the effects of growth rate and oxygen impurities on the optical and electronic properties. For Ge2Sb2Te5, the optical gap decreases with increasing growth rate, and the inverse slopes of the exponential band tails (Urbach tails) extending into the gap also decrease with increasing growth rate (i.e., the band tails become sharper at slower growth rate). The increase of the optical gap for oxygen concentrations greater than about 10^{21} cm^{-3} is almost certainly due to the presence of oxygen at levels approaching alloy compositions. On the other hand, the sharpening of the band tail absorption is probably due to increased diffusion on the surface during growth with decreasing growth rate.

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