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Growth and characterization of $Ba_8Ga_{16}Ge_{30}$ Type I clathrate thin films grown by pulsed laser deposition[1] JACOB DUSCHA, Macalester College/ University of South Florida, ROBERT HYDE, DEVAJYOTI MUKHERJEE, SARATH WITANACHCHI, University of South Florida — $Ba_8Ga_{16}Ge_{30}$thin films were successfully grown on Si (100) substrates using pulsed laser deposition process. Clathrates are studied for potential thermoelectric (TE) applications with few reports of thin film growth due to intrinsic difficulty in growing the caged structures in thin film form. Growth of stoichiometric $Ba_8Ga_{16}Ge_{30}$thin films is complicated by non-congruent evaporation during the ablation process resulting in Ga or Ge deficient films, degrading their properties. We report a systematic study of the growth parameters for stoichiometric $Ba_8Ga_{16}Ge_{30}$thin films. The laser ablated plasma plumes were analyzed using ICCD imaging and optical emission spectroscopy enabling optimization of growth parameters. Film thickness profiles of various target-substrate distances were plotted to estimate an optimum deposition rate. Surface morphologies and structure of the as-deposited films were examined using a scanning electron microscope and x-ray diffraction technique. This investigation provides a new direction towards the growth of high quality thin films for potential TE device applications.

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Jacob Duscha
Macalester College/ University of South Florida

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