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Title of the Thesis: Photo and Thermally Induced Effects in Solution Driven Chalcogenide Thin Films for Photonics Device Applications

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ABSTRACT

Mid infrared region wavelength has emerged as a growing research area over the years in, IR imaging, environmental sensing, and military as well as civil area defence systems. Microlens arrays and gratings are critical IR components for these applications due to their adaptive optical nature. Fabrications, of most of these optical elements are difficult and require expensive IR materials and fabrication tools. Hence, there is need of materials that are cheap, transparent in the mid infrared region, easy to create structures are needed

High refractive index, high non-linearity and transparency in mid IR reason make chalcogenide glasses suitable material for IR optics development. Several techniques have been reported in recent years to fabricate optical components in these glasses. However, processing limitations in these materials have made challenging to get cheap IR optical components in chalcogenide glasses.

To overcome processing issues, we propose simple and easy solution phase deposition and patterning techniques in chalcogenide glasses which opens door as a promising route towards the realization of novel optical components for IR application. Our thesis work is divided in three different parts.

In the *first* part of the thesis, solution preparation and dissolution kinetics for As_2S_3 and As_2Se_3 chalcogenide glass will be discussed. Further, effect of germanium and selenium on the dissolution of As_2S_3 chalcogenide glass will be presented.

In *second* part, prepared solutions are used for the thin film development using spin coating. Optical and electrical properties of As_2S_3 and As_2Se_3 chalcogenide glasses are investigated and further compared with thermally deposited thin films.

In *third* part, IR optical components fabrication such as micro lenses and grating will be discussed.