Evaluation of the Optical and Electrical Properties of Oxy-chalcogenide Glasses

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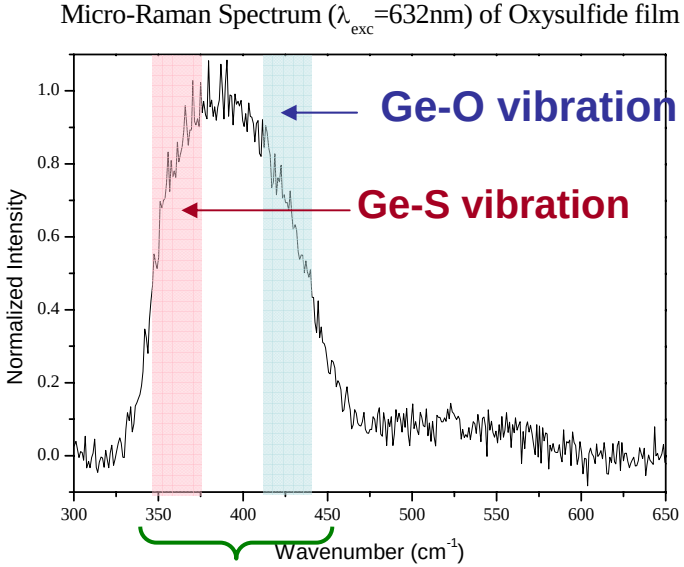
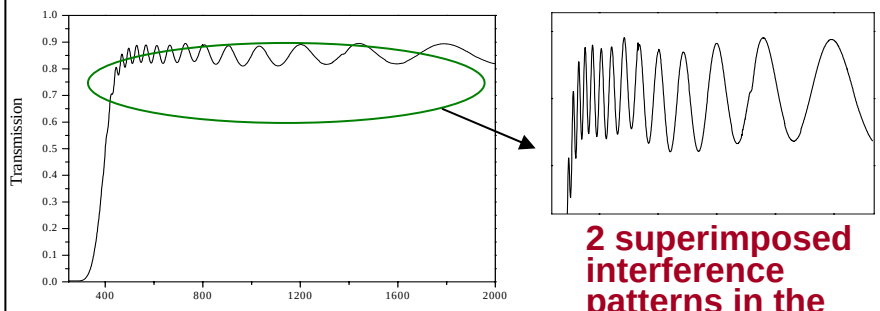
The preparation of oxysulfide and nitrided sulfide materials for optical and electrical applications offers a unique trade off between the superb chemical stability of the oxide and the excellent optical properties of sulfide. The effect of oxygen-substitution by sulfur has been investigated in germanium-based glasses. We have demonstrated the successful production of amorphous oxysulfide film through RF sputtering of targets produced by the sulfination of germanium-based oxide glasses at temperatures near the glass transition.

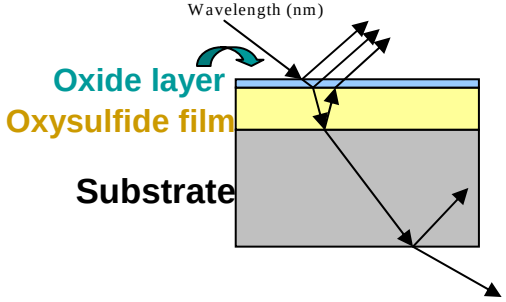


Transmission spectrum of the oxysulfide film



2 superimposed interference patterns in the transmission spectrum of the resulting film suggest the presence of a

⇒ SECOND layer



Current efforts focus on the optimization of process parameters and resulting film properties. The presence of an oxide layer has been observed at the surface of the oxysulfide film (left). Micro-Raman spectroscopy has been used to confirm the presence of Ge-O and Ge-S covalent linkages in the resulting films (above). The resulting germanium-based oxysulfide films are believed to exhibit improved thermal- mechanical robustness as compared to sulfide materials and can be used in photonics devices.

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EDUCATION

Undergraduate and graduate students have contributed to this study. UCF undergraduate Nathan Carlie, has carried out work related to this program both at UCF and in Bordeaux as part of CREOL's INTL REU program. This work has resulted in several refereed publications and presentations including the INTL REU workshop held in Paris (France) last July. Shown (below left) is Nathan with his advisors Kathleen Richardson and Laeticia Petit after receiving his award (April 2004) and cash prize for Outstanding Paper at UCF's *Showcase for Undergraduate Research Excellence (SURE)* for his work on "New Germanium-Based Sulfide Glasses for Telecommunication Applications." Shown (middle) are ISU students GRA Bryce Campbell and URA Andrew Wright standing bedside the RF sputtering system they designed, constructed and have successfully used to produce the first thionitride fast ion conducting thin film electrolyte. Shown (right) is Maxime Blangero who came as an INTL REU student to UCF during the summer (2004) from the University of Bordeaux I to work on processing and characterization of silver-doped chalcogenides. Support for this work comes from International REU program (#EEC- 0244109).