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Chalcogenide Glasses-New advances

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Chalcogenide glasses containing S, Se or Te constitute a rich family of vitreous semiconductors. There has been intense research activity based on these glasses in the view of basic Physics as well as device technology. The freedom allowed in the preparation of glasses in varied composition brings about changes in their short-range order and thus results in variation of their physical properties. It is therefore easy to tailor their various properties as desired for technological applications. These materials have a wide range of applications such as making optical fibers, memory devices, reversible phase change optical recording etc. Besides the wide commercial/device applications like switching, memory and xerography etc. of Se, it also exhibits a unique property of reversible transformation . This very property makes it very useful in optical memory devices.
The effects of impurities on the electronic properties of amorphous chalcogenide glasses have been the subjects of serious debate ever since their discovery . It has long been known that these glasses, which behave like intrinsic P-type semiconductors, are insensitive to doping and that this behavior is attributed to the local valence saturation of the dopant atom. Fermi level is considered to be pinned due to the equilibrium between the negatively and positively charged (D- and D+) daggling (D) bonds . The concept of pinned Fermi level is not consistent with the discovery of the surprising phenomenon of P-N transition or conductivity type reversal first observed in bismuth germanium chalcogenide glasses. This discovery has led to extensive research on these materials and to a reconsideration of the existing theories of electronic structure of chalcogenide glasses. The carrier type reversal in germanium chalcogenides requires incorporation of a significant amount of bismuth.
In this talk we present a overview of recent trends and research on these materials and our contribution towards understanding their optical and structural properties and applications.

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