

Ion diffusion in chalcogenide glasses and its application in ionics and optics

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Ion conducting chalcogenide glasses are the analogous of oxide glasses where oxygen is replaced by a chalcogen, essentially sulphur or selenium. Because of the large polarisability of these atoms, oxide and chalcogenide glasses have very different physicochemical properties.

In the first part of the talk the main characteristics of ion containing chalcogenide glasses with an emphasis on the diffusion property will be presented.

In the second part of the talk, it will be shown that the diffusive process either under an electric field or due to light energy is at the basis of many potential or actual applications :

- lithium conducting chalcogenide glasses with conductivity as large as 10^{-3} S cm⁻¹ at room temperature are considered as potential electrolytes for solid state batteries;
- silver or copper conducting chalcogenide glasses are currently studied for the development of non volatile electrical memories;
- owing to the large diffusivity of silver under illumination, silver doped chalcogenide glasses have been used for the development of devices for microoptics. Silver photodissolution is at the basis of the fabrication of diffraction gratings, microlenses, photoresists and even waveguides ; photodeposition has been used to produce optical memories while rewritable recording materials are based on local crystallisation of a Ag-doped chalcogenide film due to controlled illumination.