Manufacturing High Purity Chalcogenide Glass

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Chalcogenide materials are finding increasing interest as an active material in next generation optical and electronic devices. There wide range of properties, ranging from photosensitivity, ability to host rare earth ions, electrical conductivity, phase change, exceptional optical non-linearity's to name only a few are fueling this interest. Moreover, the ability to synthesize these materials in numerous forms as diverse as 2D monolayers, microspheres, optical fibres, nanowires, thin films as well as bulk glass ingots of over a kilogram in size ensures their application space is vast.

We began preparation of chalcogenides, largely based on sulphides, in 1992 and since then have built up an extensive capability for their purification, synthesis and fabrication in various forms. A key aspect of this facility is the ability to process in a flowing atmosphere of hydrogen sulphide which provided the capability of synthesis from elemental, oxide or halide precursors, processing through various chemical vapour deposition reactions as well as post purification.

In this talk we describe the range of materials we synthesize highlighting high purity sulphide bulk glass and transition metal di-chalcogenides for electronic applications, crystalline semiconductors for solar cell applications, low power phase change memory devices, switchable metamaterial devices as well as traditional chalcogenides glass and optical fibre.

Biography

Prof Dan Hewak leads a research group investigating novel glasses for optoelectronic devices. He obtained his PhD from the University of Waterloo, Canada, in 1989, where he studied planar optical waveguides and devices. He spent three years with the National Optics Institute in Quebec City before joining the ORC where his work on optical materials was funded by IBM and Digital Equipment Canada. Since 1991 he has been with the ORC where he has developed a broad range of experience in new optoelectronic materials, and in particular amorphous chalcogenides. In the past five years DH has worked on 10 major projects, 6 as project leader and participated in 8 EPSRC funded projects as a principle and co-investigator. Relevant past EPSRC funded work includes integrated microsphere circuits, from which the world's first chalcogenide glass microsphere and microsphere lasers emerged, optical and electronic phase change memory and work on advancing the applications of chalcogenide glass and photonic devices. He has published over 250 refereed papers and conference publications and is the holder of eleven patents for novel glasses and their applications. He has presented his work internationally as both invited and contributed talks. DH has an extensive network of UK and international collaborators, both in academia and industry and serves on the TC20 Committee of the International Congress on Glass. He is editor of IEE published textbook: 'Properties, Processing and Applications of Glass and Rare-Earth Doped Glasses for Optical Fibres' and serves on the Editorial Board for the Journal of Materials Science: Materials in Electronics.