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Advanced IR glass and fiber technology

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Chalcogenide glasses, with their high refractive indices, low phonon energy, high nonlinearity and excellent transmission in the infrared (IR) region, make them ideal for incorporation into various civilian, medical and military applications such as infrared detectors, infrared lenses, planar optics, photonic integrated circuits, lasers and other non-linear optical devices. Chalcogenide glasses have also been widely studied for use in numerous potential optical fiber applications such as fiber lasers, amplifiers, bright sources, as well as passive solid and hollow core IR fibers for laser transmission. Although stable, low-loss chalcogenide based fibers with minimum loss of <0.1 dB/m have been demonstrated, the chalcogenide based fibers suffer from absorption and scattering losses mainly caused by impurities related to hydrogen, carbon and oxygen. Great efforts have been made in reducing optical losses using improved chemical purification techniques, but further improvements are needed in both purification and fiberization technology to attain the theoretical attenuation. We have also designed and developed negative curvature, anti-resonant fibers and demonstrated record low loss in the 9.75 – 10.5 μm range. In this paper, we review our recent effort in the development of low loss chalcogenide fibers, by describing the various purification methods and their impact on the optical fiber loss and discuss the potential future outlook for these fibers.

Biography

S S Bayya received his PhD in Ceramics from Alfred University in 1992. He is a Research Scientist in the Optical Science Division at the Naval Research Laboratory (NRL) since 1994. His research interests include transparent ceramics, bulk optics and IR fibers for various optical applications. He currently heads the Optical Materials section at NRL. He has >50 publications and holds 30 patents on optical materials.

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