Ravinder K Jain, Biomed Res 2018, Volume 29 | DOI: 10.4066/biomedicalresearch-C7-018

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GLASS BASED ADVANCED MID INFRARED PHOTONIC DEVICES

Advances in low loss high purity glasses were initially driven by fiber-optic communications, and the related interest in developing low loss optical fibers covering a variety of spectral regions, which in turn led to development of fibers as rare earth and transition metal ion host media for numerous unique fiber amplifier and attenuator applications. Much lower Rayleigh scattering losses achievable at longer wavelengths spurred the development of low loss mid-IR fibers leading to three dominant families of glass fibers, namely fluorides, chalcogenides, and tellurites. Of these families of mid-IR fibers and glasses, the fluoride glass fiber technology has emerged as the most mature because of its unique combination of broad transparency, glass stability, and its "fiberizability" into low-loss single-mode fibers.

The "fiberizability" of glasses is not only significant for fiber lasers and amplifiers, but is also a good measure of the glass stability, which is quite critical for making high-Q microresonators with a low amount of light loss due to scattering from crystallites and surface roughness. More recent work has focused largely on the development of high optical nonlinearity glasses for applications ranging from Raman amplifiers and comb generators to continuum generation. I will review device optimization issues related to glass based mid infrared optoelectronic devices, notably mid infrared fiber lasers and fiber amplifiers, nonlinear optic frequency convertors and comb generators, and microresonators for sensors and mid-IR microlasers. The use of advanced fabrication techniques for fabrication of mid-IR glass fibers and mid-IR microresonators, including the use of specialized molds for pouring molten glass to cast such microresonators will be discussed. Specific achievements – including the attainment of >20 Watts of output power in mid-IR fiber lasers will be discussed, along with the prospect of achieving narrow linewidth sub-megahertz operation of mid-IR fiber lasers spanning the entire mid-IR spectral range between 2-7 microns.

Biography

Ravinder K Jain is professor of ECE and physics at the University of New Mexico. After obtaining his PhD in electrical engineering from the University of California, Berkeley, and spending over 15 years in industry, notably Bell Labs, Hughes Research Labs, and Amoco Technology Company, he transitioned to academics as an Endowed Chair of Microelectronics at the University of New Mexico, where he served as associate director for the alliance of photonics technology. He has served on several professional society and conference committees, the board of governors at IEEE-LEOS, the board of directors at the Optical Society of America (OSA), and is currently serving as an associate editor for Optics Express. He has an H-index of 36 with over 160 publications and over 20 patents, and is a recipient of numerous professional awards, including SPIE's Edgerton award and is a fellow of OSA, IEEE, SPIE, and the American Physical Society.

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