Recent Progress in supercontinuum generation in nonlinear optics fibers,

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A longstanding challenge since the invention of the laser has been the development of efficient methods to exploit nonlinearity to convert laser light to new wavelengths. Supercontinuum (SC) generation in optical fibers has been shown to offer a convenient and elegant solution to this challenge, as it massively broadens the laser spectrum while maintaining a spatially coherent output [1]. This provides an inherently fiber-delivered broadband light spectrum possessing the brightness of a laser and the spectral width of a lamp, capable of replacing most light sources used today in optical metrology, spectroscopy, and microscopy. Important applications of fiber-based broadband SC sources include bio-imaging, optical coherence tomography (OCT), material processing, optical sensing, absorption spectroscopy, and optical frequency comb technologies. The last few years have seen significant research efforts focused on extending the wavelength coverage of SC sources towards the 2 to 20 µm molecular fingerprint mid-infrared (MIR) region and in the ultraviolet (UV) down to 100 nm, while also improving stability, noise and coherence, output power, and polarization properties.

In this talk I will review a selection of recent advances in SC generation in a range of specialty optical fibers, including fluoride, chalcogenide, telluride, and silicon-core fibers for the MIR; UV-grade silica fibers and gas-filled hollow-core fibers for the UV range; and all-normal dispersion fibers for ultralow-noise coherent SC generation. I will summarize the significant developments that have been made in reaching target UV and MIR wavelength ranges, and ultra-low noise coherent SC sources. As the result, the fiber SC has matured considerably to become a truly disruptive technology able to meet a range of societal and industrial challenges.

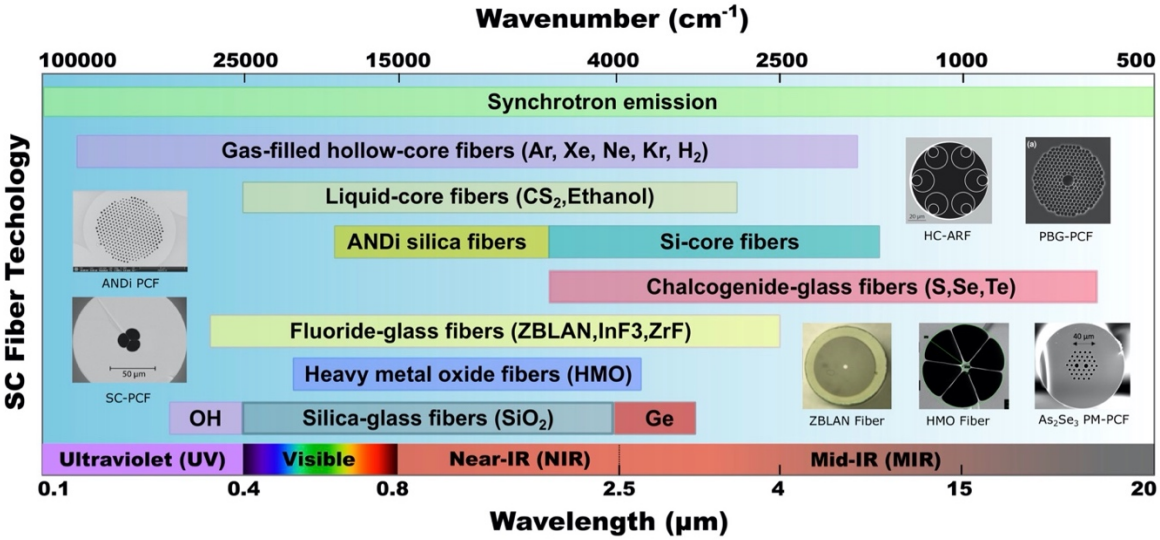

Figure 1: Survey of SC bandwidths in various specialty optical fibers from UV to MIR ranges.

1. T. Sylvestre, E. Genier, A. N. Ghosh, P. Bowen, G. Genty, J. Troles, A. Mussot, A. C. Peacock, M. Klimczak, A. M. Heidt, J. C. Travers, O. Bang, and J. M. Dudley, "Recent advances in supercontinuum generation in specialty optical fibers [Invited]," J. Opt. Soc. Am. B 38, F90-F103 (2021).

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