Compositionally Manipulating Nonlinearities in Novel Optical Fibers Based on the Molten Core Method

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One impediment of the continued advancement of optical fibers for high powered applications are optical nonlinearities such as Stimulated Brillouin and Raman Scattering[1]. The power threshold above which these parasitic phenomena occur is proportional to the area of the fiber through which the light travels divided by the gain coefficient of the fiber's material.

The conventional approach to mitigating these nonlinearities focuses on making the effective area bigger, but this leads to more complex fiber cores, lower yield in fiber production, as well as other unintended consequences. This research focuses on manipulation the gain coefficient by changing the composition of the fiber core using the molten core method (MCM) for fiber fabrication. This allows for a much more straightforward fabrication process where the material does the work for you, resulting in a much simpler and conventional core/clad fiber design.

Using the MCM allows for previously unattainable all-glass fiber core compositions, which can open the doors to many novel fibers with useful optical properties[2]. This paper provides an overview of results to date and offers new insights into future opportunities, glass systems, and properties critical to next generation fibers.

[1] P.D. Dragic, M. Cavillon, J. Ballato, *Materials for optical fiber lasers: A review* (Applied Physics Reviews, 2018) 5(4):041301.

[2] J. Ballato, P.D. Dragic, *Rethinking optical fiber: new demands, old glasses* (Journal of the American Ceramic Society, 2013) 96(9):2675-92.