

# Silica Optical Fibres via 3D Printing Technologies

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**Abstract:** We report recent progresses and discuss key technical challenges in research and development of specialty silica optical fibres via 3D printing technologies.

With superior optical, dielectric, thermal, mechanical, chemical properties, silica glass remains the most important material for optical fibres. Silica fibres have found wide and vital photonic applications and maintained the dominant presence in optical fibre communication networks, fibre sensing networks, fibre amplifiers and lasers, and specialty optical fibres. As the development and application of silica optical fibres keep expanding and diversifying, new fabrication technologies with greater material capability and structure flexibility are increasingly important and additive manufacturing or 3D printing technology is emerging as a promising one [1]. 3D printing technology has been developed for manufacturing complex structures from a great variety of materials, including silica, by fusion, sintering, polymerisation or solidification techniques. Its great flexibility is the main reason for developing special silica optical fibres, e.g. those involve sophisticated design requirement for geometrical structures and material compositions and are difficult for conventional CVD or stacking technologies. In addition, 3D printing is advantageous for fast prototype of new silica fibres with substantial time and cost saving. Recent development of nano silica material technologies offers great prospects for realising specialty silica optical fibres based on 3D printing [2]. In this talk we will present recent progresses and discuss key technical challenges in developing specialty silica optical fibres via 3D printing technologies.

[1] Peng, G. D., Luo, Y., Zhang, J., Wen, W., Chu, Y., Cook, K. and Canning, J., "3D Silica Lithography for Future Optical Fiber Fabrication", in Peng, G. D. (ed.), *Handbook of Optical Fibers*, Springer Nature, Singapore, 637-653, (2019)

[2] F. Kotz, K. Arnold, W. Bauer, D. Schild, N. Keller, K. Sachsenheimer, T. M. Nargang, C. Richter, D. Helmer, and B. E. Rapp, "Three-dimensional printing of transparent fused silica glass", *Nature* 544, 337, 2017



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