High Power Silica Fibre Based Mid-IR Lasers

Objectives:
- Design and fabricate loss low hollow core fibres for MidIR nonlinear applications
- Package hollow-core fibres for real applications
- Use hollow core fibre to convert NIR pump source to MidIR efficiently

Novelty:
- Novel fibre design to achieve low loss in MidIR
- New fibre fabrication process
- New fibre package/interface

Research Challenges:
- Loss mechanism of silica hollow-core fibre in mid-IR
- Low-loss guiding for both pump and lasing wavelengths
- Fabrication using local facility
- Interfacing/Packaging

Advantages:
- Less Rayleigh scattering
- Potential to achieve low loss
- Low nonlinearity
- Efficient for light gas interaction

Simulation:
Nature of the tube lattice fiber with split cladding. (a) The two columns show the hollow core mode and the cladding mode respectively for a frequency \( F=2.5 \) in band I. Inset: zoom in view of cladding mode, the fast intensity oscillation can be observed. (b) Same as in (a) for \( F=3 \) in band II. (c) Confinement loss of fundamental mode plotted as the function of normalized frequency \( F=2\frac{\lambda}{\lambda_n}^2-1 \). (d) Intensity profile of fundamental mode along the horizontal and vertical cross-section, respectively.

Fibre Fabrication

Home made stacking machine
16mm diameter preform

Stack capillaries
Second step drawing
114um inner diameter fibre
2.5mm diameter cane

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