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Assorted Core Air-Clad Fibre

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The optical properties of air-clad fibres are critically dependent on core size and can be of particular interest for sensing applications. For example, significant overlap between the guided mode and the air occurs when the core is small relative to the wavelength of light. By measuring absorption, the evanescent field located in the holes could be exploited for gas sensing [1]. Such a device would require only very small volumes of gas and could be coiled compactly.

We demonstrate a new method for fabricating fibres with essentially air-clad cores, which relies on techniques developed in the production of holey optical fibres. Holey fibres are typically drawn from a stack of silica tubes surrounding a central solid silica rod, which ultimately forms the core [2]. When thin walled capillaries are used, additional cores can form at regions where capillaries meet [3], with differing sizes resulting from variations in tube dimensions. Here we present such an {\em assorted core} fibre which contains many independently addressable small, air-clad cores ranging in dimension from 1.2 microns to 3.4 microns. (see Figure).

Each core in this selection will possess radically different values for properties such as dispersion, effective non-linearity and air/mode overlap, from which it is possible to pick and choose. For example, core K has 17 % of the mode located in the air at 1550 nm. In future the fabrication of optical fibres with an even greater range of core sizes should be attainable by increasing the range of tube dimensions, allowing great flexibility in device design.

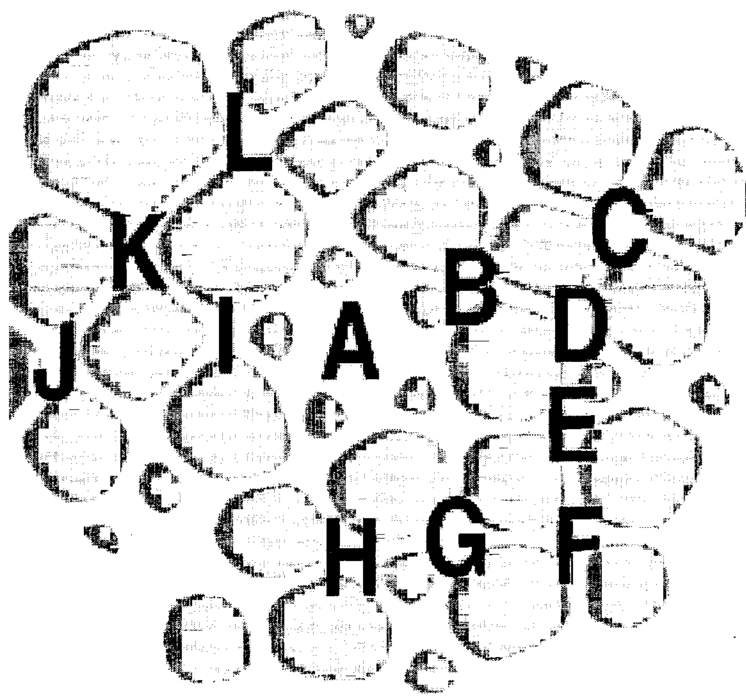
Figure caption:

SEM photograph of central region of assorted core fibre showing the primary core A and additional cores B--L. The outer fibre diameter is approximately 180 microns.

[1] T.M. Monro, D.J. Richardson and P.J Bennett "Developing holey fibres for evanescent field devices" Electronics Letters 1999 Vol.35(14) pp.1188-9.

[2] P.J. Bennett, T. M. Monro and D.J. Richardson "Towards practical holey fibre technology: Fabrication, Splicing, Modeling and Characterization" Optics Letters 1999, Vol.24(17) pp.1203-5

[3] P. Kaiser and H.W. Astle. "Low-loss Single-Material Fibers Made From Pure Fused Silica" The Bell System Technical Journal, July - August 1974 pp 1021-39.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