Optical characterisation of germanium optical fibres

P Mehta, N Healy, N F Baril, M Krishnamurthi, P J A Sazio, V Gopalan, J V Badding and A C Peacock

Optoelectronics Research Centre, University of Southampton, Southampton SO17 1BJ, U.K.

nvh@orc.soton.ac.uk

Semiconductor core optical fibres are currently generating great interest as they promise to be a platform for the seamless incorporation of optoelectronic functionality into a new generation of all-fibre networks [1,2]. Although recent attentions have primarily focused on silicon as the material of choice for semiconductor photonics applications, germanium has some advantages over its counterpart. For example, it has higher nonlinearity, extended infrared transparency and has recently been demonstrated as a direct band gap laser medium [3]. Here we present the first optical characterisation of a germanium core optical fibre. The fibre was fabricated using a chemical micro fluidic deposition process [1] that uses GeH_4 (germane) as a precursor to deposit amorphous germanium into the hole of a silica capillary. Figure 1 (a) shows an optical microscope image of the polished end face of a germanium fibre, with a 5.6 µm core diameter, which has been completely filled with the semiconductor material. Optical transmission measurements have been conducted over the wavelength range 2 µm to 11 µm, to confirm the broad mid-infrared operational window, and the guided output at 2.4 µm, imaged using a Spiricon Pyrocam III pyroelectric array camera, is shown in Figure 1 (b). At this wavelength the optical loss has been measured to be 20 dB/cm, which is comparable to losses measured for amorphous silicon fibres in the infrared. The potential for these germanium optical fibres to be used as optical modulators and infrared detectors will be discussed.

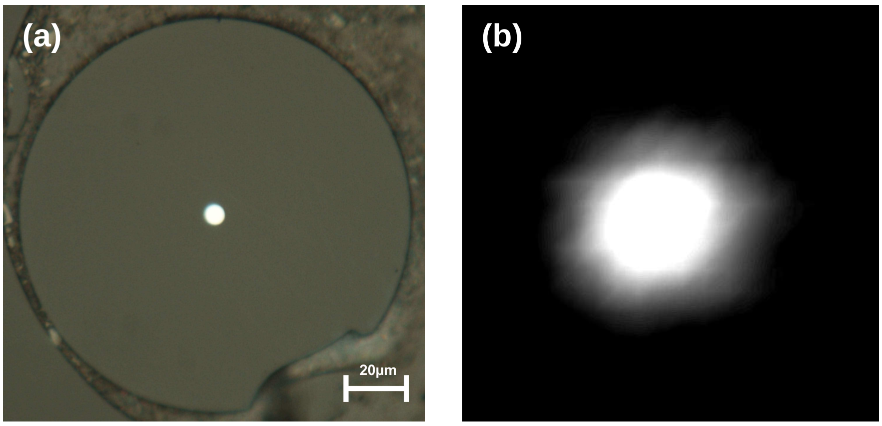

Figure 1: (a) The polished end face of the germanium optical fibre and (b) an image of the transmitted light at an operating wavelength of 2.4 µm.

References

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