submitted to International Ouantum Electronics Conference IOEC 2002. Moscow

Photonic band gap guiding in microstructured polymer optical fibres

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Abstract: Experimental and theoretical investigation of photonic band gap guidance in an air-core microstructured polymer optical fibre will be presented. Both conventional hexagonal-symmetry band gap fibres and air-core Bragg-guiding ring structures will be discussed.

OCIS codes: (060.0060) Fiber optics and optical communications; (060.2280) Fibre design and fabrication; (160.5470) Polymers; (230.4000) Microstructure fabrication

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The fabrication of Microstructured Polymer Optical Fibre (MPOF) was demonstrated recently [1]. Single-mode MPOF was fabricated with the conventional hexagonal arrangement of holes, and ring-structured MPOF was fabricated in which the holes are arranged on concentric circles [2]. In this paper, recent progress in MPOF fabrication is reported, including the experimental investigation of photonic band gap (PBG) guidance in MPOF with an air core, similar to that observed in silica microstructured fibre [3].

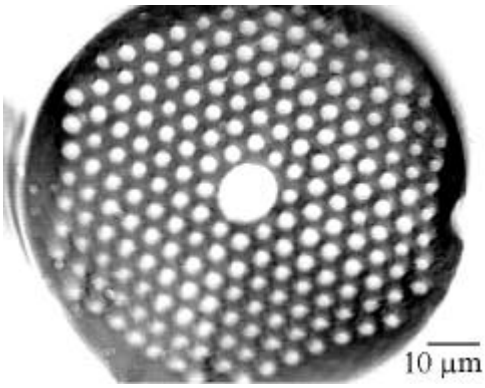

Fig. 1. Optical micrograph of an air-cored microstructured polymer optical fibre. The average distance between the holes is 5.1 microns and the hole diameter is 3.3 microns.

We present first evidence of photonic band gap guiding through short lengths of MPOF with a structure such as shown in Fig. 1. On-going work is focusing on the fabrication of polymer PBG fibres with a larger air fraction and smaller hole spacing to achieve a larger bandwidth of the guided light. In addition, Bragg-guiding ring structures such as discussed in [4] will be presented, in which concentric rings of air holes effectively constitute a multiple-layered Bragg fibre to achieve air guidance.

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