11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Preparation and characterization of PMMA based microstrutured polymer optical fibers

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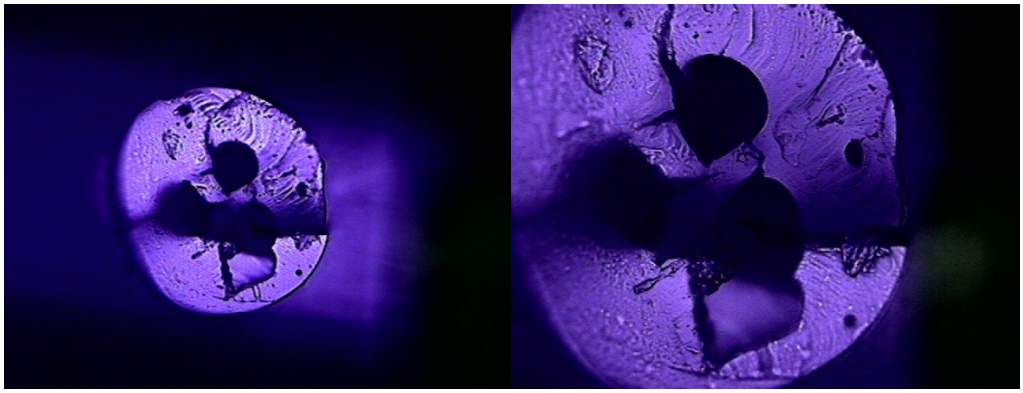
Abstract: *Comparing to glass fibers POFs display large attenuation limiting their applications in long distance communications. However, for short distances POFs can be very well used. Moreover in local networks POFs are preferred to glass fibers due to environmental issues related to silica fibers. In this work we present results on the preparation of Poly(methyl methacrylate) (PMMA) fibers. Two different methods are used for the preparation of fibers, drawing and extrusion. Good quality, homogeneous and transparent rods were produced by this process. From the PMMA rods microstructured fibers have been obtained. The holes structure has been well preserved in the final fiber. Systematic charcterization of the optical properties will be presented.*

Polymer optical fibers (POFs) were introduced by DuPont in the mid-60s at around the same time as the glass optical fibers have been suggested as a means of transmission for optical communications. Comparing to glass fibers POFs display large attenuation limiting their applications in long distance communications. However, for short distances POFs can be very well used. Moreover in local networks POFs are preferred to glass fibers due to environmental issues related to silica fibers.

In this work we present results on the preparation of Poly(methyl methacrylate) (PMMA) fibers. Two different methods are used for the preparation of fibers, drawing and extrusion. In both methods PMMA pellets are first dried for 1 hour at 90°C. In the drawing method the pellets are hot pressed sintered for 2 hours at 240°C and 1 ton of pressure. Good quality, homogeneous and transparent rods were produced by this process.

From the PMMA rods microstructured fibers have been obtained. Holes have been obtained in the rods by drilling and then fibers have been pulled at temperatures around 220°C. The figure below shows an optical microscope image of a fiber. The holes structure has been well preserved in the final fiber. Systematic charcterization of the optical properties will be presented.



Opical microscope image of a microstrcutured PMMA optical fiber