27th PPS Annual meeting
2011, Marrakech, Morocco

OP-B-975 Tuesday, May 10, 2011, 05:40-06:00 pm
Room: Reda 2

TWO PHOTON STRUCTURING OF 3D OPTICAL WAVEGUIDES IN FLEXIBLE POLYSILOXANE MATERIALS

R. Woods[ab,]*, S. Feldbacher[a], D .Zidar[a,b], G. Langer[c] V. Satzinger[d] W. Kern[b]

[a] Polymer Competence Center Leoben GmbH, Roseggerstrasse 12, A-8700 Leoben Austria, [b] Institute of Chemistry of Polymeric Materials, Montanuniversität Leoben, A-8700 Leoben, Austria, [c] AT&S AG, Fabriksgasse 13, A-8700 Leoben, Austria and [d] Institute of Nanostructured Materials and Photonics, Joanneum Research, A-8160 Weiz, Austria

** Rachel.woods@pccl.at*

This work concerns the recent development of a new polysiloxane material, which is used in the application of the integration of optical interconnections on printed circuit boards. To produce optical interconnects, two-photon polymerisation, induced by a femto-second laser is utilised in the fabrication of optical waveguides, embedded in a polysiloxane matrix. The high photon density obtained in the focus of the laser results in the polymerisation of acrylate functional groups, attached to a polysiloxane backbone, causing an increase in the refractive index. A silanol terminated polysiloxane, cured by condensation reaction in the presence of a Sn catalyst, has been investigated for this application. The material needs to fulfill a number of requirements to be a suitable candidate in this field, including low curing temperature, a high refractive index contrast between the matrix cladding material and the written waveguide and must have sufficient flexibility and high thermal, chemical and long-term stability. The material currently being investigated is characterised by FTIR spectroscopy, simultaneous thermal analysis and ellipsometry measurements. TPA material testing has been carried out to produce 3D waveguide structures, which are characterised by phase contrast microscopy and cut back investigations. Optical interconnects have also been fabricated on specially designed substrates, with waveguide structures aligned correctly between optoelectronic components, resulting in the increase of the transmitted photocurrent after TPA structuring. Room temperature curing enables fast and straightforward material processing, with the matrix material also being compatible with a specific two photon photoinitiator. This recently developed flexible polymeric material is highly suitable for applications in two photon processing of optical waveguides.