Stage III - 30.09.2009

The aim of the 3rd stage of the project was the realization of organo-metallic polymeric heterostructures and their processing by LIFT using a ns pulsed laser. The obtained structures have been characterized morphologically and structurally.

Fabrication of organo-metallic heterostructures on transparent substrate (MAPLE)

The synthesized compound [Cu(II) 2,2' - dihydroxyazobenzene] was deposited in the form of thin film using the MAPLE technique (Matrix Assisted Pulsed Laser Evaporation). The targets were 1% Cu(DAB)2 frozen solutions dissolved in toluene, and the laser used was a pulsed Nd:YAG laser, working at a 355 nm wavelength. The depositions were carried out on quartz substrates, and the obtained samples were subsequently used as targets for the LIFT experiments.

SEM and XRD analysis on CuDAB films show a particular crystallinity and ordering transferred in the thin film as well.

Laser induced forward transfer (LIFT)

The thin layers obtained by MAPLE were used as donor layers in the LIFT (Laser Induced Forward Transfer) experiments, using the same Nd:YAG laser, but this time working with the 4th harmonic (266 nm wavelength, 5 ns pulse duration). A diaphragm and a lens were used to control the size of the spot and to avoid the focusing of the laser in the transfer area. Experimentally, it was proven that through imaging techniques a laser spot with a very well controlled energetic uniformity can be achieved.

The donor layer (the film deposited by MAPLE on quartz substrate) and the receiver (glass) are placed in contact on a XYZ translation system. The LIFT experiments were conducted using high energies per pulse, of 1, 0.7, 0.5, and 0.3 mJ, respectively. Through this variation of the laser energy a control of the size of the transferred pixels was achieved, and pixels with diameters between 30 and 1000 microns were obtained. The entire experiment was monitored using the CCD camera.

Atomic force microscopy (AFM) analysis of several areas of the samples reveals that these are smooth, with a relative roughness of approximately 5 nm.