

Templates for Engineered Nano-Objects for use in Microwave, Electronic Devices and Biomedical Sensing Applications

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Underpinned by IPR from two previous EC projects (PTM&GMR and NANOPTT), EC-NANOTEMPLATES project aimed at extending the Frontiers of Science in the area of making nanotemplates in order (1) to synthesise nano-objects presenting advantageous properties discontinuities arising from the nano-regime and (2) to explore the potential for innovative and high value added applications.

Nanoporous templates have been developed and fabricated employing technology based on heavy ion bombardment and track etching of polymer films or polymer layers deposited on varied substrates like wafer, glass or metal. Track etching process has been extended to new types of templates and further fundamentally investigated by in-situ FTIR spectroscopy of heavy ion irradiated polycarbonate film and model compounds. Templated growth within track etched material was therefore efficient for production of arrays of controlled metallic - single (Co, Ni, Au), alloys (CoFe, NiFe), multilayered (Co/Cu) - or polymeric - light emitting polymers – nanoobjects which have been characterised regarding their specific optical, magnetic and chemical properties :

- spin dependent phenomena - GMR, TMR, spin filtering, magneto-coulomb effect and spin transfer torque phenomena - in magnetic nanoobjects;
- microwave properties of ferromagnetic nanowire arrays embedded into a polymer template;
- spontaneous emission rate of confined light emitting polymer (polyLED and nanoOLED);
- bio-applications using microfluid devices including pure magnetic (Ni), pure gold and bilayered Ni/Au nanowires.

This work has been done in collaboration with the ‘unité de physico-chimie et de physique des Matériaux’ (PCPM) and the ‘Laboratoire d’Hyperfréquence’ (EMIC) of the UCL, THALES SA (FR), EPIGEM Ltd (UK), CNRS ORSAY(FR), CENTRO RICERCHES FIAT (IT), UNIVERSITY OF DURHAM (UK) and UNIVERSITY OF NEWCASTLE (UK).