TOWARDS HETEROGENEOUS INTEGRATION WITH FUNCTIONALIZED NANOIMPRINTED POLYMER SURFACES

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Nanoimprint lithography (NIL) is an emerging nano-patterning technique with expanding number of possible applications. Although it may initially have targeted semiconductor applications an exponential increase of the use of NIL in various fields has been reported. A notable feature of NIL is its relatively low cost, which allows researchers to explore applications of nanopatterning that might have been economically unaffordable given the extraordinary cost associated with the beam based lithography process.

Printable polymers can be tailored to have a surface upon which molecules self-assemble. Furthermore, the resulting surfaces can be heterogeneously structured with or without etching away parts of imprinted polymers, in order to provide a flexible platform for structured surfaces with functional materials.

In this paper we show results of how nanoimprinted polymer surfaces could be used as templates for various applications. In particular we demonstrate multicolor emission by means of gas phase deposition of one type of dye molecule on a pre-patterned polymer substrate. The difference in color is due to the spectral shift of the dye molecules when subjected to different aggregation states (Fig. 1). In another example we illustrate that nanopatterned surfaces could be modified by growth of polymer brushes to create either hydrophobic or hydrophilic surfaces and moreover to attach to them luminescent nanocrystals.

Our results demonstrate that NIL is a feasible, high resolution and high throughput lithography technique which can be combined with other cost efficient self assembly approaches to fabricate functional devices such as biosensors and light emissive displays.

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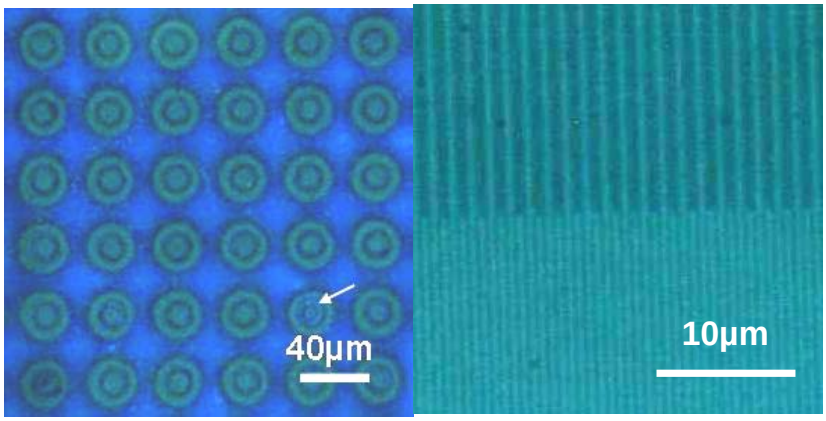

Figure 1. Fluorescence micrographs of ANP evaporated on patterned substrates with: a) 10 nm ANP on quartz/ PDMS rings and quartz discs embedded in PDMS matrix; b) 4 nm ANP on lined structure of PMMA with a resolution down to 300 nm. The colour change (420 and 490 nm) depends only on surface engineering of the PDMS layer containing the dye molecule. Parameters: evaporation rate and dye concentration.