FIRST COMBINATORIAL FABRICATION OF FLUORESCENT METALLIC PATTERNS BY SOFT LITHOGRAPHY

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Procedures for the fabrication and visualization of patterns often rely of specific binding between molecules. Specific interactions between antibody and antigen are often used for fabrication and visualization of patterned surfaces.[1] Smart methods like affinity microcontact printing have been used to produce reproducible protein arrays by μCP. Ligand-metal interactions and other supramolecular interactions have been used to build up 3D structures on a solid substrate.[2] Nevertheless, the diversity in the patterned structures is restricted by the elaborated design and by the use of a very limited number of substrate-ligand pairs with high specific interactions. Even though combinatorial methods have been applied to soft lithography techniques, the scope of these studies has been restricted to a unique printable substrate. In contrast to these specificity-based patterning methods a new combinatorial methodology for fabrication and direct visualization of multicolor metal ion sub-millimeter patterns is presented. Microcontact printing is successfully used to transfer a library of metal salts onto differently functionalized fluorescent monolayers on glass.[3] The fluorescence of the sensitive monolayers is enhanced or quenched depending on the chemical propierties of the monolayer and applied metal ion (Figure 1). Beside the simplicity in the pattern generation, this approach offers the advantage of the easy high throughput analysis, the result is a library of multicolor patterns that can be visualized by fluorescence microscopy without additional tagging steps.

In essence, the basic concept of this approach is the fast generation and screening of substrates, which store fluorescent metallic patterns that can be erased upon exposure to an appropriate environment, e.g solvent, a competitive analyte, light, etc. A number of applications for this simple technology are for example, producing materials for rewritable data storage, sub-millimeter luminescent and metallic patterns, nanosensors, and fabrication of multicolor patterns useful as non-binary optical elements.

The methodology presented here will open a new and simple route for other scientist interested in pattern creation and their application to nanotechnology.

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Figures:

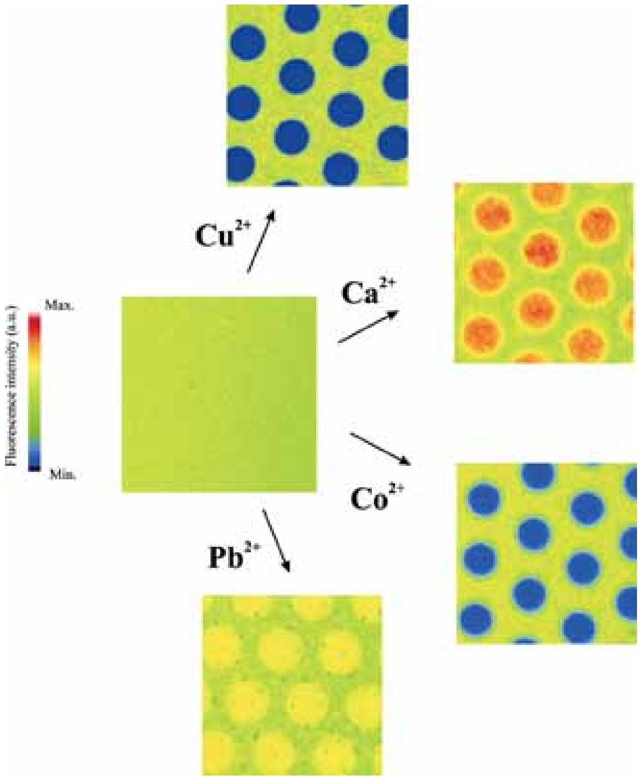

Figure 1. Fluorescence microscopy images of a fluorescent monolayer on glass in which Cu^{2+}, Ca^{2+}, Co^{2+}, Cu^{2+} were printed with a PDMS stamp with 10 µm diameter dots features separated by a period of 5 µm as an array of dots. The image without dots corresponds to the initial fluorescence image of the fluorescent self-assembled monolayer before printing the metal ions. The color bar on the left side represents the fluorescence emission intensity scale of the images.