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A MICROSYSTEM FOR AIR QUALITY MEASUREMENT IN FUTURE HOUSINGS

CHEMISTRY ACROSS THE THEMES

2. Sustainable Chemistry, Materials and Resources for the City of the 2050s

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Abstract

Nowadays, about half of humanity is housed in cities, a number expected to rise up to more than 2/3 by 2050 [1]. Whether such a prediction is accurate is not relevant, we already experience the major issue that breathing a reasonably pure indoor air is becoming. Analytical chemistry has thus tremendous challenges ahead, among which the ability to design sensing elements for continuous air quality monitoring in closed environments.

Functional materials with specific optimized properties are a growing part of modern chemistry and such materials may lead to disruptive solution in the field of analytical chemistry. For instance, hybrid porous materials prepared by the Sol-Gel process may be turned into functional sensing materials through careful formulation and process control [2]. Incorporating such materials into microsystems is one promising way to new sensing approaches but their integration for sensing purposes into microsystems is far from being straightforward, which probably explains that it has not been reported yet.

We have developed a microsystem based on an innovative microfluidic design and functional materials integrations that allows for gas detection and is compatible with continuous air quality measurements. First, we will describe the specificity of its design concerning micro-reactors fabrication and sensing capability. The preparation of the microfluidic device from micro-milled brass molds, and the method for fast and neat preparation of hundreds of individual micro-reactors will be reviewed. Then, the keys steps necessary to integrate functional materials into this device, such as the control of gelation will be explained. Special emphasis will be put on the interesting materials behavior within the microsystem. Finally, we will demonstrate the ability of our microsystem to perform quantitative optical detection of one of the main indoor air pollutants: formaldehyde [3]. Based on air quality regulation, we will discuss the possibility of using such air quality monitoring microsystems in housings.

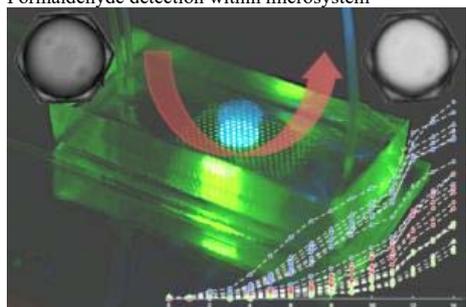
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Formaldehyde detection within microsystem



Keyword 1

Microfluidic

Keyword 2

Chemistry of Materials

Keyword 3

Analytical Chemistry

Keyword 4

Indoor Air Quality

Keyword 5

Smart cities