Integration Of Optofluidic And Other Functionalities

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Many chemical and biological experiences are time consuming and require repeated and laborious operations. This is also the case for biomedical and pharmaceutical studies. Imaging that we can put all necessary equipments of a laboratory on a chip of several square centimeters, the most of these experience steps could be done in an integrated and efficient way. This is the concept of the so-called *laboratory on a chip* or *micro-total analyses systems*.

In such a lab-on-a-chip system, all operations are based on manipulation of minute chemical solutions, cells or bio-molecules immersed in a small quantity of fluid (*microfluidics*). Conventional processing such as mixing, separation, purification as well as detection and analysis will require much reduced reagents, power and space consumption but provide much increased efficiency. High throughput screening also becomes possible. Besides, microfluidic devices can be produced massively at low cost and the application area is very broad, ranging from fundamental research to drug discovery, diagnostics, minimal-invasive therapy, precision surgery and drug delivery.

During the past few years, many efforts have been devoted to the demonstration of lab-on-a-chip capabilities but integration of various functionalities is always one of the challenges. In this talk, we highlight our approaches based on newly developed nanofabrication technologies. In particular, we will show how to create new optofluidic functionalities for chemical and biological applications. Examples of microfluidic lasers on a chip and their uses in ultra high sensibility detection will be given and perspectives of using integrated optofluidic functionalities for single cell and single molecular analyses are discussed.