Fabrication of Microwave Micoreactor for in-situ X-ray Absorption Studies of Nanomaterials in Solution

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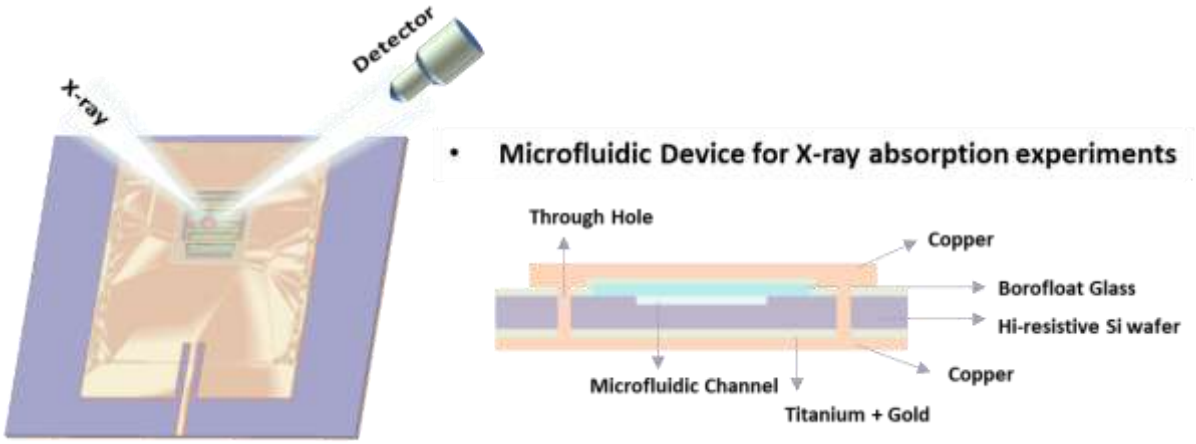
Abstract

Understanding the dynamics of chemical reactions plays a crucial role in the control of reaction mechanisms and paves the way for developing more efficient nanomaterial synthesis. Particularly, X-ray Absorption and Emission Spectroscopy. (1) However, most X-ray synchrotron studies so far are limited to seconds or minutes time resolutions, whereas FEL experiments cover the phenomena in fs regime. We aim to fill the time gap from ms to μs, to get better understanding of diffusion-driven processes.
Here, we present a concept and fabrication strategy of a Si/glass-based microwave microfluidic device.
The device offers a high microwave heating performance with sufficient stability and precise temperature adjustment up to 120°C for long-term measurements.
By scanning the channels with μm resolution in-situ X-ray absorption measurement can be performed and high-quality data can be collected even from the intermediate stages of the reaction. Thus, the μm spatial resolution is transferred in sub-ms temporal resolution, depending only on the flow speed of the solution in the channel.



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