*Supplementary information*

# A Novel Method for Online Measurement of Impurities in Uranium by Coupling Microfluidics with ICP-MS

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## 1. The hydrophobic modification of the microfluidic device

Since the parallel two-phase laminar relies on the separation of the immiscible phases, the selective modification of the side which contacts with organic phase into hydrophobicity will improve the separation of the two phases. The modification is performed by the formation of Si-O bond between OTS and the hydroxyl group on the surface of the channel, and the condensation between adjacent OTS molecules will form networks with high rigidity and hydrophobicity.

In this process, pure xylene was always infused into the micro-channel from one of the outlets to remove any air in the micro-channel with the flow rate of 40μl $min^{-1}$. Then 5% OTS-xylene (w/v) was infused into the micro-channel from the other outlet with the same flow rate for 15 minutes. At the end of the modification, the solution of 5% OTS-xylene was first stopped so that OTS cannot contact with the undesired surface of the micro-channel. After the modification, the micro-channel was cleaned sequentially with ethanol and deionized water.

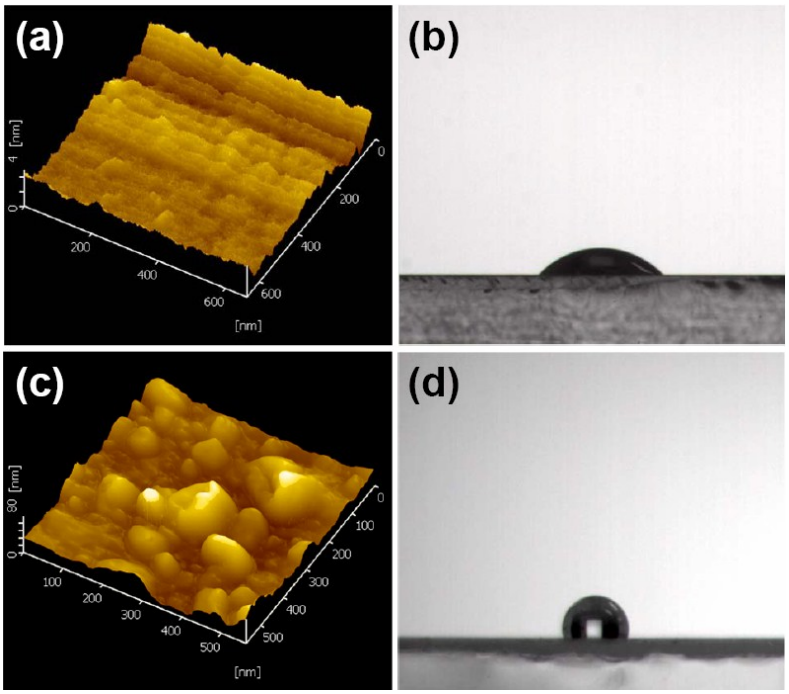


**Figure S1. The AFM images of the surface roughness (a) before and (c) after the modification, and the contacting angles (b) before and (d) after the modification.**

Although we cannot obtain in situ structure of the inner surface of the modified micro-channel, the glass plates treated with the same procedure was characterized for the contacting angle and roughness. As shown in Figure S1, the contacting angle increase from 45° to 105° after the modification, and the surface roughness also increase dramatically. As a result, the similar inner surface structure of the modified micro-channel is expected.