

Microfluidic Approach toward Continuous and Ultra-Fast Synthesis of Metal-Organic Framework Crystals and Hetero-Structures in Confined Microdroplets

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Herein, we report a novel nanoliter droplet-based microfluidic strategy for continuous and ultra-fast synthesis of metal-organic framework (MOF) crystals and MOF hetero-structures. Several representative MOF structures such as HKUST-1, MOF-5, IRMOF-3 and UiO-66 were synthesized via solvothermal reactions within a few minutes. The approach was then successfully extended to the preparation of demanding Ru3BTC2 structure that requires high-pressure hydrothermal synthesis conditions. Finally, three types of core-shell MOF composites, Co3BTC2@Ni3BTC2, MOF-5@DiCH3-MOF-5 and Fe3O4@ZIF-8 were synthesized by exploiting a unique two-step integrated microfluidic synthesis scheme in a continuous flow mode. The microfluidic strategy allowed continuous fabrication of high quality MOF crystals and composites exhibiting distinct morphological characteristics in a time-efficient manner and represents a viable alternative to the time-consuming and multi-step MOF synthesis processes.