Supplementary Materials

Microfluidic-controlled synthesis of uniform TiO_2 nanofluids for enhanced CO_2 capture: quantitative elucidation of micro-convection enhancement mechanism via one-dimensional unsteady diffusion model

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Supplementary Figures

TiO_2 synthesized via microfluidics is compared with samples prepared by conventional ultrasonic-assisted batch processing. The detailed comparison results are shown in **Figure S1**.

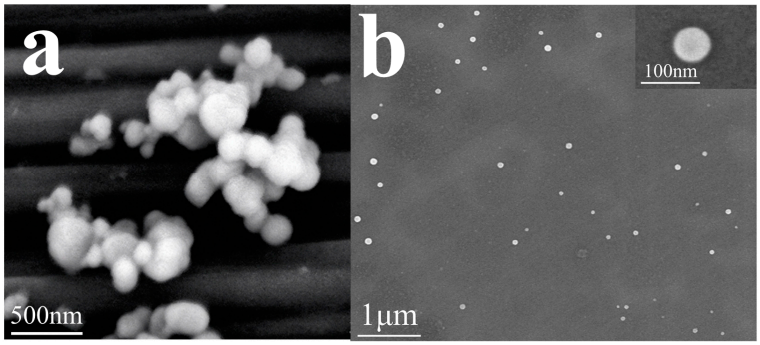

Figure S1. (a) SEM of the traditional batch method. (b) SEM of the microfluidic preparation method.

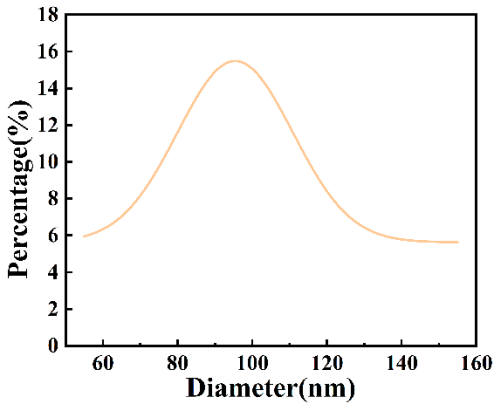

Figure S2. Particle size distribution map of samples prepared by the traditional batch method

Regarding the CO_2 absorption performance data for the batch sample: We would like to indeed attempt to evaluate its mass transfer performance. However, since the batch-synthesized samples are completely precipitated within 5-10 minutes, it is physically impossible to maintain a stable nanofluid during the required nearly 2-hour static absorption test. Rapid sedimentation leads to an immediate loss of the gas–liquid interface area, causing the diffusion model to fail. Therefore, the inability to obtain

meaningful absorption data precisely validates that the microfluidic strategy is indispensable for the production of high-performance and stable nanofluids for CO_2 capture.