Continuous synthesis of high-performance isobutylaluminoxanes in a compact and integrated approach

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Abstract

We present a 3D-printed continuous flow platform for controllable synthesis of isobutylaluminoxanes (IBAO), an effective olefin polymerization co-catalyst, via highly exothermic hydrolytic reaction of triisobutylaluminum (TIBA). This platform encompasses modules of mixing and reaction, in-line separation, and in situ UV-vis characterization. In addition, two NMR protocols are established to validate the results of in-line UV-vis analysis (31P NMR) and reveal product structures (1H NMR). Measured temperature profiles over the reactor indicate essentially fast heat removal, ensuring inherent safety. Subsequently, co-catalytic activity of IBAO is obtained by ethylene oligomerization experiments using an iron-based catalyst system at atmospheric pressure. Furthermore, we investigate the influence of key operating parameters including initial molar ratio between water and TIBA, initial TIBA concentration, and residence time. High IBAO yield over 98% and superior co-catalytic activity of ˜5000 kg·(mol Fe)–1·h–1 are achieved with optimized parameters in this single-pass platform, demonstrating the advantages of process.

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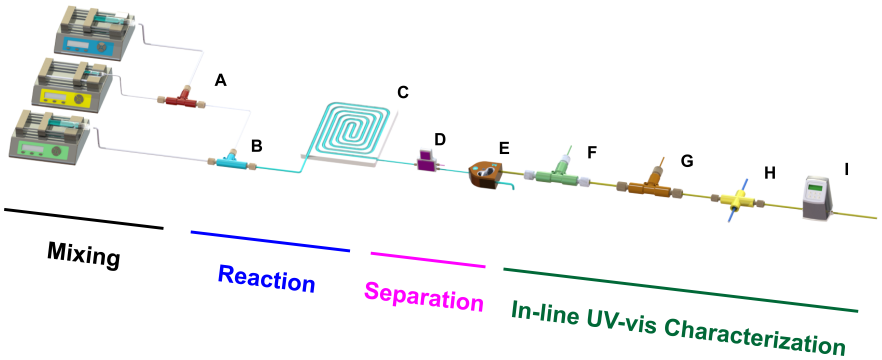

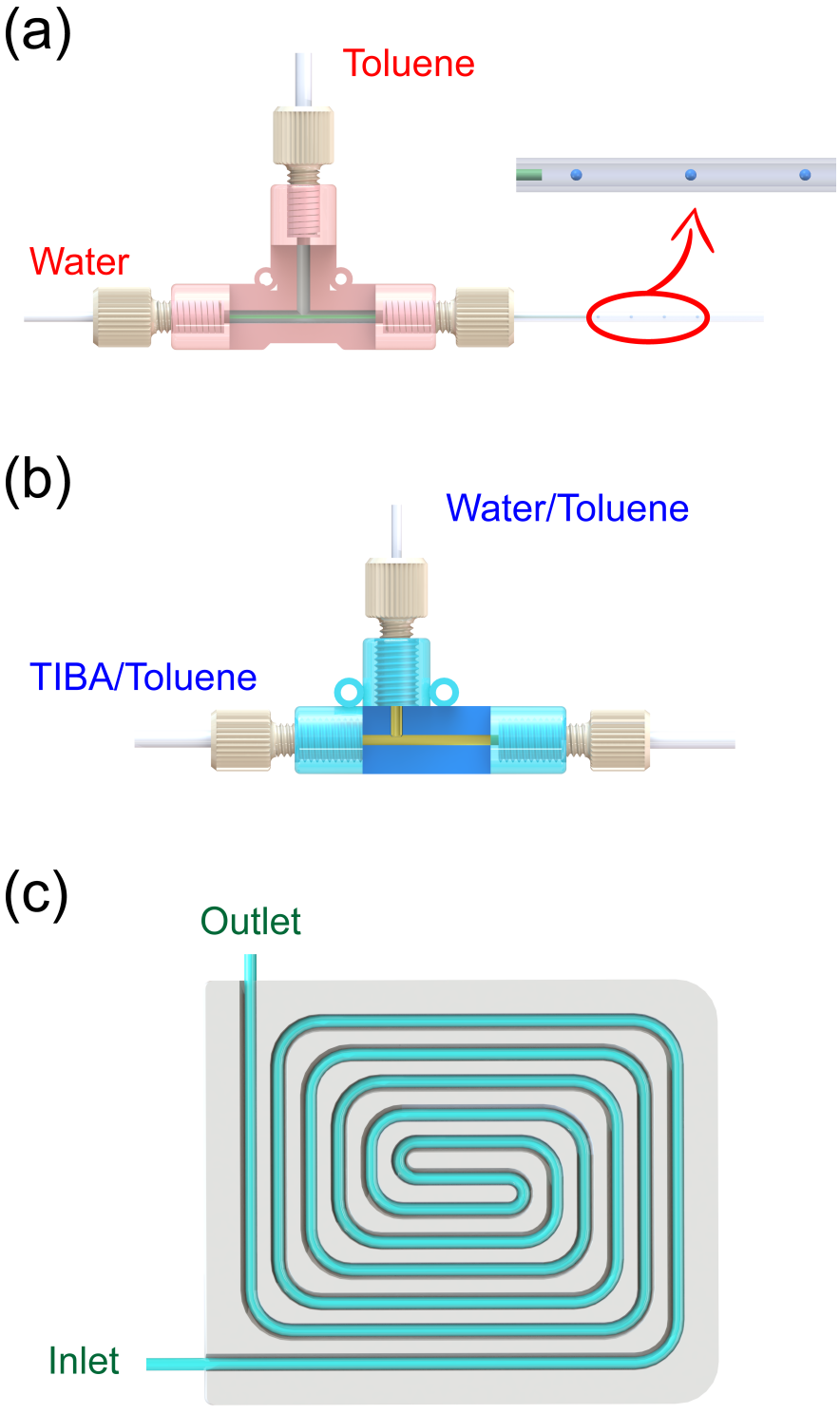

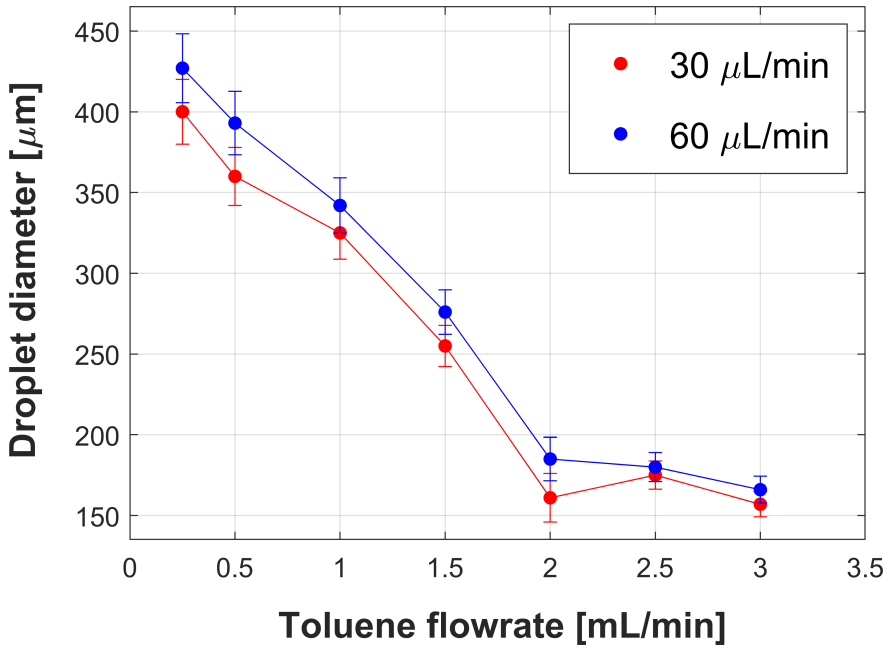

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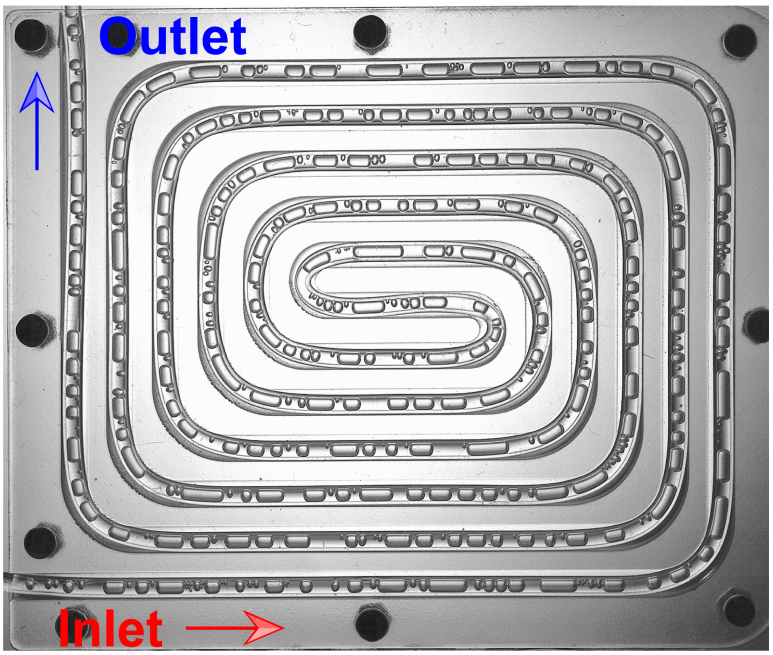

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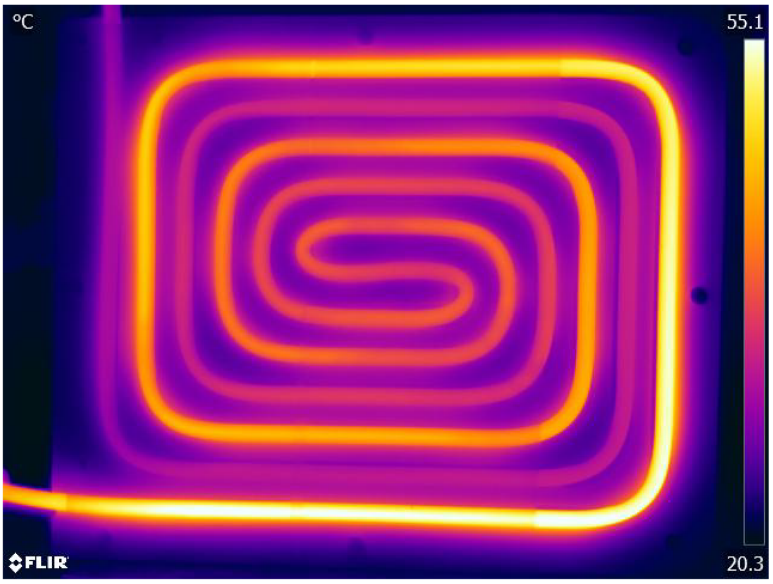

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