Ready, steady, flow: Pd-loaded hypercrosslinked microreactors for the flow synthesis of paracetamol

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Porous organic materials have garnered increasing interest in various scientific and industrial fields due to their versatile properties.[1] A promising application for porous polymers is their use as noble metal catalyst supports, due to their excellent stability, reusability, and high density of active sites.[2] We describe the implementation of monolithic polymerised high internal phase emulsions (polyHIPEs) as catalyst supports for the continuous flow synthesis of paracetamol. PolyHIPEs are formed by polymerisation of particle and surfactant-stabilised water-in-oil HIPEs comprising of a divinylbenzene and divinylbenzene/4-vinylbenzyl chloride monomer continuous phase. The polyHIPEs were post-functionalised by hypercrosslinking using the Scholl coupling reaction to yield polymers decorated with organophosphorus moieties and surface areas of up to 500 m²/g. The phosphorus moieties act as catalyst anchor sites for the subsequent loading of Pd via a Pd−O=P ligand bridge. The Pd-loaded polyHIPEs are used as catalysts for the reduction of 4-nitrophenol to 4-aminophenol, achieving turnover numbers of ~2,000. The Pd-loaded polyHIPEs and a non-functionalised divinylbenzene-based polyHIPEs are fabricated into flow-cells and used en route to Plant-on-a-Bench as microreactor/mixer for the continuous flow synthesis of paracetamol with a yield of 66%.[3]

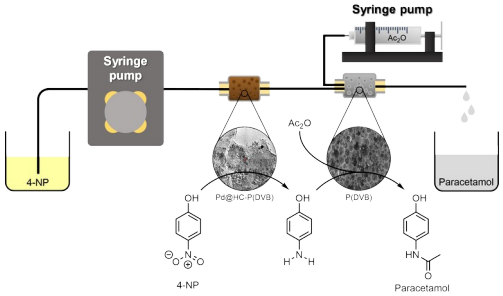

Figure 1: Flow cell assembly for the continuous synthesis of paracetamol

Keywords: Flow synthesis, Micromixer, Microreactor, polyHIPE, Catalysis

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