Development of a Simple Reversible-Flow Method for Preparation of Micron-Size Chitosan-Cu(II) Catalyst Particles and Their Testing of Activity

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A simple flow system employing a reversible-flow syringe pump was employed to synthesize uniform micron-size particles of chitosan-Cu(II) (CS-Cu(II)) catalyst. A solution of chitosan and Cu(II) salt was drawn into a holding coil via a 3-way switching valve and then slowly pumped to drip into an alkaline solution to form of hydrogel droplets. The droplets were washed and dried to obtain the catalyst particles. Manual addition into the alkaline solution or employment of flow system with a vibrating rod, through which the end of the flow line is inserted, was investigated for comparison. A sampling method was selected to obtain representative samples of the population of the synthesized particles for size measurement using optical microscopy. The mean sizes of the particles were 880 ± 70 µm, 780 ± 20 µm, and 180 ± 30 µm for the manual and flow methods, without and with the vibrating rod, respectively. Performance of the flow methods, in terms of rate of droplet production and particle size distribution, are discussed. Samples of 180 µm size CS-Cu(II) particles were tested for catalytic reduction of 0.5 mM p-nitrophenol to p-aminophenol by 100-fold excess borohydride. The conversion was 98% after 20 min, whereas without the catalyst there was only 14% conversion.
Reference:

A. Intanin, P. Inpota, T. Chutimasakul, J. Tantirungrotechai, P. Wilairat, R. Chantiwas.* Development of a simple reversible-flow method for preparation of Micron-size chitosan-Cu(II) catalyst particles and their testing of activity. Molecules (2020), 25, 1798. doi:10.3390/molecules25081798