Dispersion Control using Taylor-Vortex Flow in the Synthesis of CuPd Alloy Nanoparticles

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In the catalytic reaction, it is very important to synthesize well-dispersed and small-sized nanocatalysts to obtain a high catalytic surface area. In this study, a facile new synthetic method to control the size and dispersion of nanoparticles by controlling the flow pattern in the reactor is first reported. A Couette-Taylor (CT) reactor is capable of generating regular and strong flow throughout the reactor. This regular and strong flow increases the reaction rate in the synthesis of nanoparticles to make the size smaller, and promotes the progression to the dispersion state rather than the aggregation state, enabling the formation of small and independent nanoparticles. Using a continuous CT reactor, CuPd alloy nanoparticles with sizes of less than 5 nm were easily synthesized. In high rotation speed of 1200 rpm, nanoparticles did not form aggregation and exist independently and stably, while only aggregates were observed in the mixed tank (MT) reactor. We also investigated the effect of various factors such as rotating speed, mean residence time, and concentration of reagents and stabilizer on the size and dispersion of CuPd alloy nanoparticles.