Synthesis and characterization of surface-modified ceria oxide nanoparticles using supercritical methanol in a continuous system

밤방, 김재훈*, 김재덕, 이윤우[1]
한국과학기술연구원; [1]서울대학교
(jaehoonkim@kist.re.kr*)

Surface-modified ceria oxide (CeO2) nanoparticles were synthesized rapidly and continuously in supercritical methanol at 400 oC, 30 MPa and a residence time of ~ 40s by using a flow type reactor system. Oleic acid and decanoic acid were used to modify surface of CeO2. TEM showed that the usage of supercritical methanol and the addition of the surface modifiers changed drastically the shape and size of the nanoparticles. When 0.3 M of the surface modifiers were used, primary particles with diameter of 2-3 nm were loosely aggregated and formed secondary particles with size of 30-50 nm. WAXD analysis revealed that the surface-modified nanoparticles retained CeO2 crystalline structure. FT-IR analysis indicated that reagents comprised of aliphatic, carboxylate and hydroxyl group chemically bounded onto the surface of CeO2 nanoparticles. The surface modified CeO2 nanoparticles showed a very high surface area (190 m2/g) compared with unmodified CeO2 particles synthesized with supercritical water (8.5 m2/g). Dispersion test showed that the addition of organic modifier into the reaction system significantly affected the dispersion stability of nanoparticles.