

Synthesis and Characterization of Pseudo-monodisperse Yttrium Oxide Particles by Homogeneous Precipitation Method

김동수*, 신명숙, 손승만¹, 권영식²
이화여자대학교 환경학과;

¹Chemical Engineering, Virginia Tech.; ²수원과학대학
(dongsu@ewha.ac.kr*)

In the present work, near-monodisperse yttria particles are synthesized in urea aqueous solution by a homogeneous precipitation method. It was found that yttrium concentration has a profound impact on the average size of particles, which systematically increases from 65nm to over 220nm. We also found that as yttrium concentration increases, not only does the size distribution broaden, but particles also start to agglomerate above 0.025M of concentration. The rate of precipitation is found to increase with urea concentration up to 3.0M. Above 3.0M, the concentration dependence is weakened. Temperature mainly affects the kinetics of precipitation, not thermodynamic quantities, which is a strong function of the concentrations of reactants. Assuming Arrhenius-type reaction kinetics, the activation energy for precipitation is obtained as 29kcal/mole. Particle morphology and the reaction kinetics are also sensitive to solution pH. While at low pH particles experience severe agglomeration, and the rate of precipitation is slow. As pH increases above 3.0, near-monodisperse yttria particles are obtained.