Sunisa Sa-a 2006: The Study of Preparation of Nano-sized CeO_2 by Microemulsion Method. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Apinya Duangchan, Ph.D. 101 pages. ISBN 974-16-2009-8

Cerium is one of the most important rare earth as its oxide has been widely used in many industries. In this study, the experiment is divided into three parts. First part is the preparation of nano-sized CeO_2 by microemulsion method using different cerium sources and surfactants. Second part is to combine homogeneous precipitation method with microemulsion method. Cerium sources and methyl oxalate were used as starting materials. The last part is to prepare microemulsion by mixing of two microemulsions obtained from cerium source and ammonium hydroxide.

Different cerium sources used in this study were cerium nitrate hexahydrate ($Ce(NO_3)_3 \cdot 6H_2O$), ammonium cerium nitrate ($(NH_4)_2Ce(NO_3)_6$) and cerium chloride heptahydrate ($CeCl_3 \cdot 7H_2O$). Polyoxyethylene-4-laurylether (PE4LE), polyoxyethy lene-10-oleylether (Brij96V) and cetyl trimethyl ammonium bromine (CTAB) were used as surfactants. The mixture of cerium compound, hexane, H_2O and surfactant was vigorously agitated by a magnetic stirrer until the solution became uniform and transparent, before the addition of hydrazinium hydrate ($N_2H_4 \cdot H_2O$) to reduce cerium ion to cerium particle. The microemulsion was dried in an oven to remove hexane and surfactant. The remaining powder was calcined at 600^oC for 1 h and the CeO_2 product was characterized by X-ray diffraction spectroscope (XRD), transmission electron microscope (TEM) and energy dispersive spectroscope (EDS).

The average sizes of the prepared CeO_2 particles are in the range of 4-11 nm and the phase of particles is crystalline. The average particle size of CeO_2 obtained from mixing of two microemulsions method are smallest, and that from combined methods of homogeneous precipitation and microemulsion are smaller than that from microemulsion method. The trend is the same with different cerium sources and surfactants. The average particle size of CeO_2 particles prepared from $(NH_4)_2Ce(NO_3)_6$ are smallest, and that from $Ce(NO_3)_3 \cdot 6H_2O$ are smaller than that from $CeCl_3 \cdot 7H_2O$. The trend is the same with different methods and surfactants. The average particle size of CeO_2 particles obtained from CTAB as surfactant are smallest, and that from Brij96V are smaller than that from PE4LE and the trend is the same with different methods and cerium sources.

_____ _____ ____/____/____

Student's signature Thesis Adviser's signature