Synopsis of Original Research Paper

Development of Spherical CeO_2 Particles for UV Shield Material with Low Environmental Load Process.

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Cerium (IV) oxide (CeO_2) is an n-type semiconductor and an oxygen ion conductor. It has many applications, such as in solid oxide fuel cells and oxygen sensors. Furthermore, the use of CeO_2 to shield materials from ultraviolet light has been intensively investigated. For these applications, regulation of the particle size distribution and the morphology are important issues. Furthermore, the processes by which CeO_2 particles are prepared must be as simple as possible. Here, we have reported that polyethylene glycol (PEG HO-(-CH_2CH_2O)$_n$-H) can be used as a solvent for inorganic salts, with the ether oxygen in the PEG acting as a base. In this research, the novel preparation method of CeO_2 fine particles were developed by using PEG solution of cerium nitrate hydrate.

Cerium oxide (CeO_2) nanoparticles were obtained by heating a polyethylene glycol solution (PEG) of cerium nitrate hydrate ($Ce(NO_2)_2$ $6H_2O$) at 383 K for 3h. When the PEG whose molecular weight was 20000, was used for the preparation, the monodispersed CeO_2, whose particle size was *ca*. 102 nm, was obtained. When the mixture of PEG20000 and ethylene glycol (EG) was used to prepare the PEG solution of cerium nitrate hydrate, the average particle size increased from 102 nm to 660 nm with an increase in the EG content of the solution. In order to investigate the formation mechanism of CeO_2, UV-VIS spectra and FT-IR spectra of the PEG solution of cerium nitrate hydrate were measured. According to the FT-IR spectra, the strength of hydrogen bond of water molecules in the PEG solutions was stronger than that of the pure water. Furthermore, the coordination strength of EG to cerium ion was stronger than that of PEG20000. These facts affected the olation and oxolation process to form CeO_2 particles from the aquo complex of cerium ion.