

HYDROTHERMAL SYNTHESIS OF SINGLE CRYSTALLINE NANO CERIA USING DIFFERENT NEUTRALIZING AGENT

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ABSTRACT

The synthesis of ceria was carried out on precipitation hydrothermal treatment and calcinations route. Urea or citric acid solutions were used as the neutralizing agents and the mixed solutions were directly charged to the autoclave and hydrothermally treatment (HT) at 120oC for 3 hrs for precipitation. sodium hydroxide or ammonia, pH was adjusted to 9 for precipitating ceria precursor. In this paper, effects of experimental parameters such as citric acid, urea, NaOH and ammonia are neutralizing agents at calcinations temperature (100, 600 and 800oC) and washing of the precursor were studied for synthesis of nano ceria powder. X-ray diffraction patterns were used as a characterization tool to identify the crystalline phases and to evaluate the crystallite size and lattice parameters. The XRD patterns showed the samples are amorphous due to presence of citric acid and urea as the precipitants. XRD peaks of the samples obtained by using ammonia showed better crystallinity when compared to synthesized with NaOH. Calcination at 600°C and 800°C resulted in the formation of crystalline ceria. Sample prepared hydrothermally with washing the precursor showed better crystallinity when compared to the unwashed one. TEM image showed the formation of single crystalline nano ceria of size 5-9 nm when washed the precursor before hydrothermal treatment. In future, lots of study can be done by using novel process. Nano ceria has been widely used in fuel cells, optical devices, gas sensors, hydrogen storage materials, polishing materials and biomedical fields.

Keywords: ceria, nano-particles, XRD, crystallinity, neutralizing agent

