

Low Temperature Solvothermal Synthesis of Nanosized Oxidic Particles

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Advancement in modern science and applied technologies is brought to its current noteworthy mechanical, electronic and thermal properties because of researches in synthesis in nanocrystalline materials. Interestingly, variation in sizes becomes distinctive when sizes reaches nanoscale which exhibits properties that are atomic and bulk characteristics¹. Although studies in nanomaterials have taken huge steps over the last few decades but its structure determination which is crucial in modelling its properties is still at its earlier stages². Modelling of nanosized particles require a comparable experimental counterpart. Hence, it is vital to synthesize high quality nanosized particles in order to obtain a realistic comparison. However, there are limitations in synthesizing such particles due to the difficulty in maintaining control over its size and its phase purity. Solvothermal synthesis following a nonhydrolytic route offers a promising solution to this problem since it is able to produce high purity and good homogeneity³ in size. In this work, we present ultrasmall zirconia nanoparticles that are well crystallized and the absent utilization of surfactants. Structural and morphological analysis of the samples were done using classical X-ray diffraction and transmission electron microscopy. Result indicates that we were able to manipulate the phase purity of our samples from a dual to single phase. Similarly, by varying its synthesis conditions we were able to exhibit a good control over the size which arranges from ~5.0 to ~1.0 nm. In addition, the modified solvothermal synthesis allowed us to synthesize nanoparticles are very low temperatures about 80°C with good compositional purity.

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