

# **One-step Synthesis, Growth Mechanism and Photoluminescence Properties of Hollow GeO<sub>2</sub> Walnuts**

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Electronic Supplementary Information

**TEM image of GeO<sub>2</sub> particle under stirring for 30min**

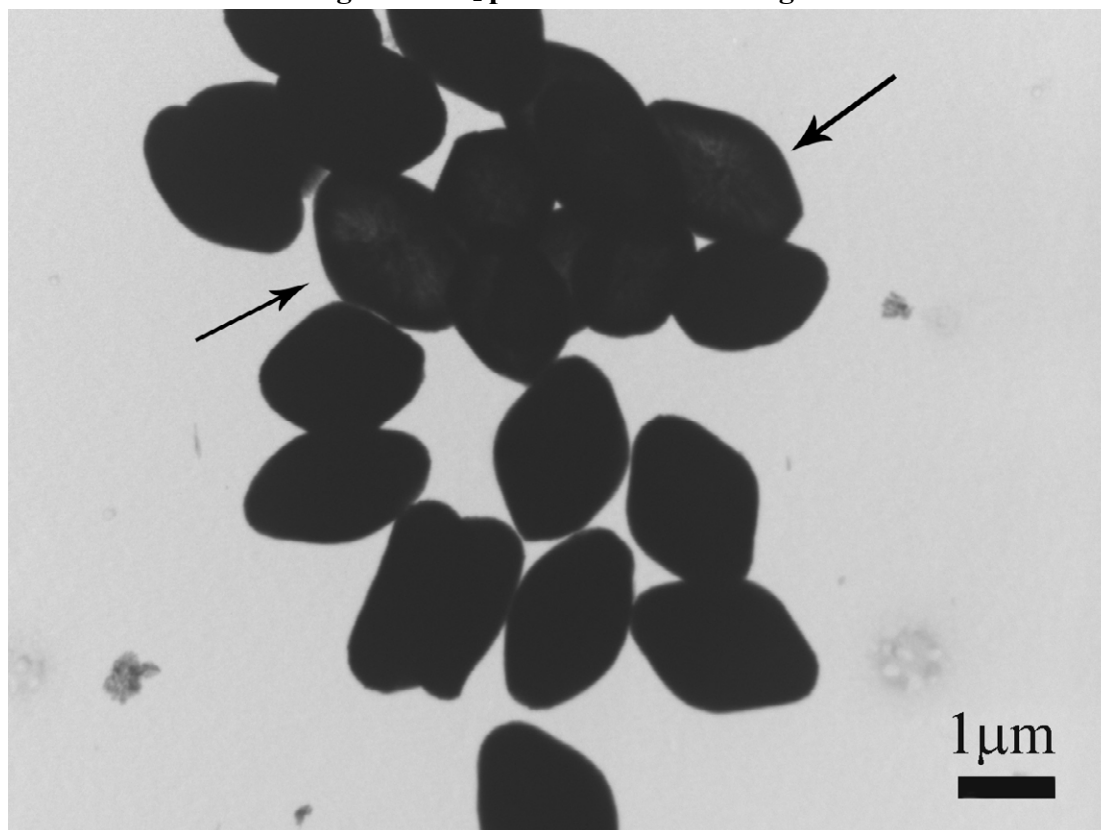


Figure S1 TEM image of GeO<sub>2</sub> particle under stirring for 30min.

We provide the TEM image of GeO<sub>2</sub> particle under stirring for 30min as shown in Figure S1, TEM image clearly shows that particles are still solid and some particle's interior start to get thinner as arrows pointed.

### Effect of aging time

To rule out the effect of stirring time, the effect of aging time conditions have also been investigated when kept stirring time. We stirred the reaction solution for 30min at the beginning. Then after aging for 1h, we collect particles from the solution. The product is well dispersed and no obvious broken are observed as Figure S2 shows in the below. And after long aging time for 6h, the product presents the obvious broken surface as shown in Figure S3, which can testify that the particles are hollow structure. Since the hollow particles undergo a aging procedure, it can be considered that the Ostwald ripening leads the hollow process.<sup>1-2</sup>

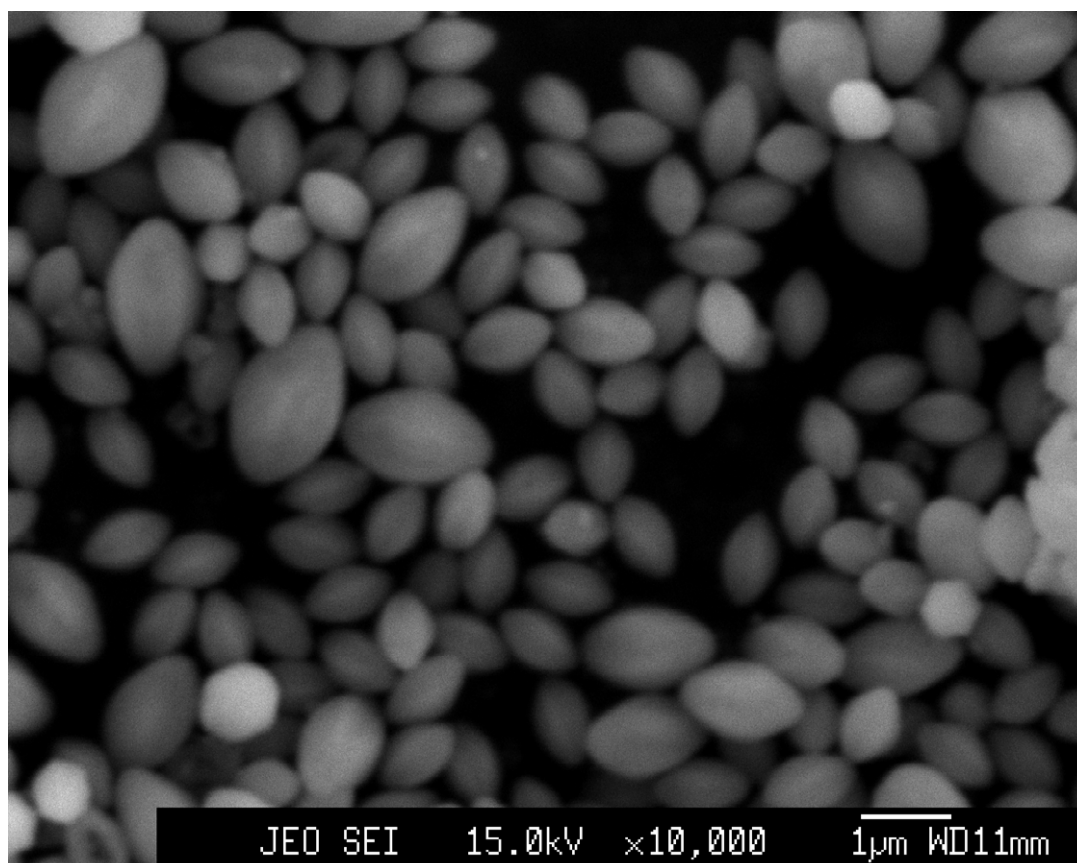


Figure S2 SEM image of GeO<sub>2</sub> particle under aging for 1h

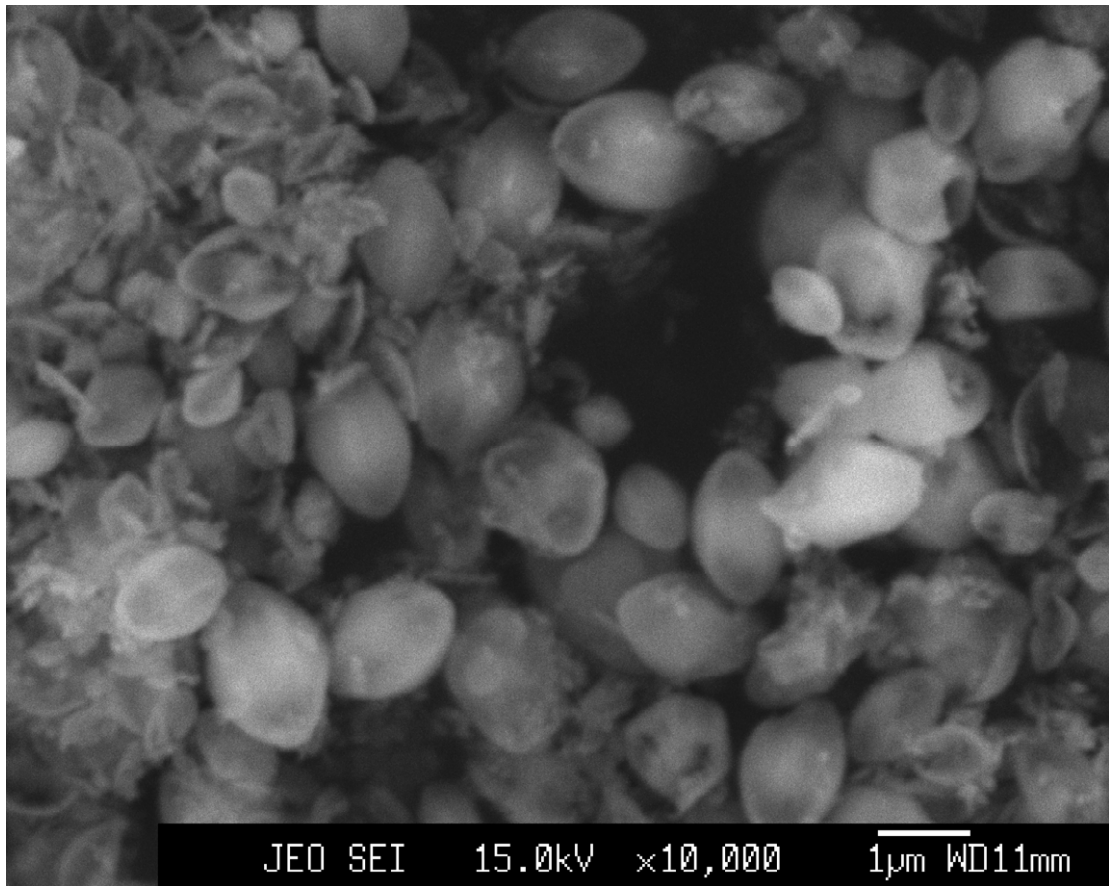


Figure S3 SEM image of GeO<sub>2</sub> particle under aging for 6h.

## Particle Size Distribution

For the preparation, the GeO<sub>2</sub> synthesized under 25°C are mono-dispersed. The mean size and standard deviation ( $\sigma$ ) of crystalline sizes was given in the below histograms

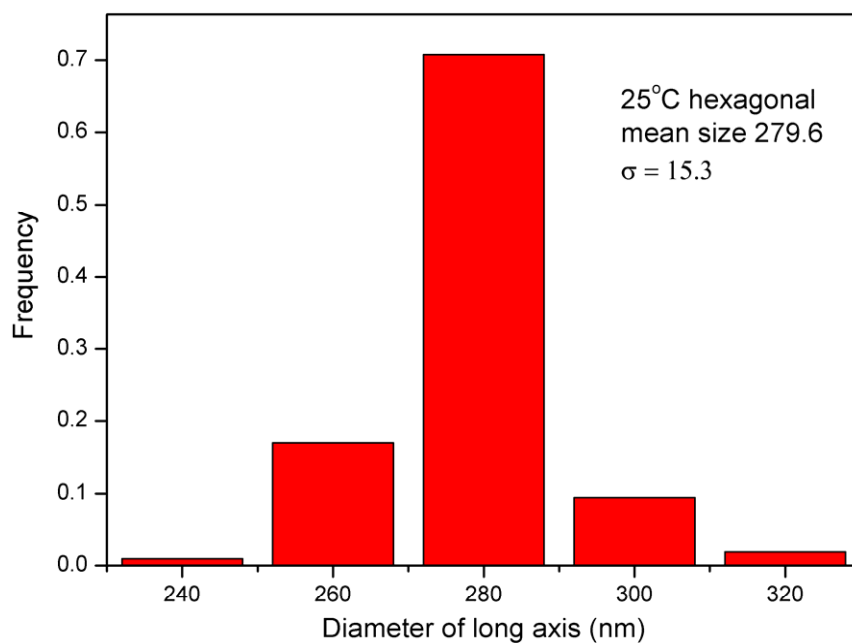


Figure S4 Histogram of 25°C synthesized GeO<sub>2</sub> particle including mean size and standard deviation

## References:

- [1] H. G. Yang and H. C. Zeng, *J. Phys. Chem. B* 2004, **108**, 3492.
- [2] Y. M. Sui, W. Y. Fu, Y. Zeng, H. B. Yang, Y. Y. Zhang, H. Chen, Y. X. Li, M. H. Li, and G. T. Zou, *Angew. Chem. Int. Ed.* 2010, **49**, 4282