

CBC SEMINAR ANNOUNCEMENT



Professor Michael Huang
National Tsing Hua University

Shape-Controlled Synthesis of Nanocrystals and Their Facet-Dependent Properties

Our group has developed facile methods for the syntheses of Au, Cu₂O, and Ag₂O nanocrystals with systematic shape evolution from cubic to octahedral, rhombic dodecahedral, and hexapod structures. The methods are water-based, easy to follow, relatively fast, low in cost, conducted at room temperature (or slightly warmed), and highly effective in shape control. Thus, the synthetic approaches are energy-efficient and environmentally friendly. New insights regarding the nanocrystal growth mechanism has been obtained from these studies. Using Au nanocubes as cores, we have synthesized Au–Pd core–shell nanocrystals with a tetrahexahedral structure exposing high-index {730} facets. We have also used Au nanocrystal cores for the fabrication of Au–Cu₂O core–shell heterostructures with well-defined shapes and specific exposed facets. They can transform into cubic and octahedral Cu₂S nanocages by forming thin Cu₂S shells first and then removing the Cu₂O cores. The nanocrystals with well-defined shapes allow for their facet-dependent property investigations. Photocatalytic activity and electrical conductivity of Cu₂O crystals were found to be highly facet-dependent and Au nanocrystal-enhanced. SERS sensitivity of gold nanocubes, octahedra, and rhombic dodecahedra has been compared. These morphology–property studies should represent a new and exciting direction for nanomaterials research.

References

- [1] C.-H. Kuo, Y.-C. Yang, S.Gwo, M. H. Huang, *J. Am. Chem. Soc.* 2011, 133, 1052–1057. [2] L.-M. Lyu, W.-C. Wang, M. H. Huang, *Chem.–Eur. J.* 2010, 16, 14167–14174. [3] W.-C. Wang, L.-M. Lyu, M. H. Huang, *Chem. Mater.* 2011, 23, 2677–2684. [4] C.-H. Kuo, T.-E. Hua, M. H. Huang, *J. Am. Chem. Soc.* 2009, 131, 17871–17878. [5] H.-L. Wu, C.-H. Kuo, M. H. Huang, *Langmuir* 2010, 26, 12307–12313. [6] C.-L. Lu, K. S. Prasad, H.-L. Wu, J.-a. A. Ho, M. H. Huang, *J. Am. Chem. Soc.* 2010, 132, 14546–14553. [7] J.-Y. Ho, M. H. Huang, *J. Phys. Chem. C* 2009, 113, 14159–14164. [8] C.-H. Kuo, M. H. Huang, *J. Phys. Chem. C* 2008, 112, 18355–18360. [9] C.-H. Kuo, Y.-T. Chu, Y.-F. Song, M. H. Huang, *Adv. Funct. Mater.* 2011, 21, 792–797. [10] P.-J. Chung, L.-M. Lyu, M. H. Huang, *Chem.–Eur. J.* 2011, 17, 9746–9752.

Date: 11th January 2012 (Wednesday)
Time: 11am – 12.30pm
Venue: NTU SPMS CBC Building Level 2,
Conference Room
Host: Asst Professor Ling Xing Yi