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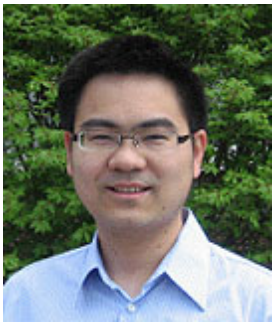
new hot papers - 2010

March 2010

(Commentary added in March 2010 for January 2010 late entry.)

PDF

Xiong Wen (David) Lou & Lynden A. Archer talk with *ScienceWatch.com* and answer a few questions about this month's New Hot Papers in the field of Materials Science.



Article Title: Hollow Micro-/Nanostructures: Synthesis and Applications

Authors: **Lou, XW;Archer, LA**;Yang, ZC

Journal: ADVAN MATER, Volume: 20, Issue: 2, Page: 3987-4019, Year: NOV 3 2008

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* Cornell Univ, Sch Chem & Biomol Engn, Ithaca, NY 14853 USA.
* Nanyang Technol Univ, Sch Chem & Biomed Engn, Singapore 637457, Singapore.

SW: Why do you think your paper is highly cited?

Compared to many other types of nanostructures, like nanoparticles, nanowires, and nanotubes, development of hollow micro-/nano-structures is still in its very early stage in terms of both syntheses and applications. Many novel synthetic methodologies emerged only during the past five years.

In this review article, we summarized the significant progress made during the past decade, including some from our own works. In general, there are only less than 500 papers in well-recognized journals. Therefore, a large number of excellent works in this field are being published.

Another reason for its high citation rate could also be that, as more facile synthetic strategies become available for many materials, applications of hollow structures are now being actively investigated in multiple fields; such as energy storage, drug delivery, catalysis, sensing etc.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

We presented a comprehensive overview of synthetic strategies for

hollow structures.

SW: Would you summarize the significance of your paper in layman's terms?

Hollow micro-/nano-structures are just tiny containers/capsules with a typical size that is one thousand times smaller than the diameter of a human hair. With such a small size, the normal fabrication processes for making hollow objects can no longer apply. Therefore, it can only rely on some chemical methods for synthesis, and significant difficulties in control of size, shape, and uniformity can be expected.

Coauthor:

Lynden A. Archer

SW: How did you become involved in this research, and were there any problems along the way?

Our research in this field started with the challenges encountered for design of high-performance electrode materials for next-generation lithium-ion batteries.

In the field, it is generally observed that the high-capacity electrode materials suffer from rapid capacity fading during charging and discharging cycles. This problem has been known to partly arise from the large volume variation during the reversible lithium insertion/de-insertion processes.

The idea is that if the electrode materials can be made in the form of hollow micro-/nano-structures, the large void space included in the structures might effectively mitigate the capacity-fading problem.

However, it's easier said than done. Not every material can be easily made into hollow structures. This had motivated us to develop some interesting synthetic methods for making hollow structures of many materials.

View Researcher ID Profile for Xiong Wen (David) Lou.

SW: Where do you see your research leading in the future?

The successes in synthesis of hollow structures have provided opportunities to tune their properties. These advances will in turn catalyze exploration in a growing list of applications.

However, in the near future, research efforts will still be focused on development of simple strategies which allow large-scale synthesis of high-quality hollow particles.

SW: Do you foresee any social or political implications for your research?

The development in hollow structures might prove to be helpful in solving some of the most pressing problems today, such as high-efficiency energy conversion and storage, biomedical treatments, and healthcare needs.

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KEYWORDS: ONE-POT SYNTHESIS; LITHIUM-ION BATTERIES; CORE-SHELL NANOPARTICLES; TEMPLATE-FREE SYNTHESIS; ENHANCED PHOTOCATALYTIC ACTIVITIES; FULLERENE-LIKE NANOPARTICLES; INDUCED SELF-TRANSFORMATION; OPTICAL-LIMITING PROPERTIES; INTERFACE REACTION ROUTE; SOLUTION-PHASE SYNTHESIS.

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2010 : March 2010 - New Hot Papers : Xiong Wen (David) Lou & Lynden A. Archer on the Successes in Synthesis of Hollow Structures

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