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Yong Lei

Technical University of Ilmenau, Germany

Template-realized functional nanostructures for energy conversion and storage devices

Functional nanostructures have drawn intensive attention with the development of miniaturization of modern and future devices. Realization of such nanostructures presents an important task for nanotechnology research and device applications. To address this challenge, template-based method provides a perfect approach owing to the geometrical characteristics of the templates. We have developed template-based nanostructuring techniques using anodic aluminum oxide (AAO) nanopore arrays and polystyrene spheres with scalable, parallel and fast processes. Employing these techniques, three-dimensional and surface nanostructures have been fabricated. The obtained nanostructures possess large-scale arrayed configuration, high structural density, perfect regularity and cost-effectiveness, and are highly desirable for constructing energy conversion and storage devices, including solar water splitting, supercapacitors and rechargeable sodium-ion batteries. The device performances demonstrated that the obtained nanostructures benefit these applications through the precise control over the structural features enabled by the geometrical characteristics of the templates. These achievements indicate the high potential and importance of template-based nanostructuring techniques for both basic research and device applications. Especially, we proposed recently a multiple nanostructuring concept using a binary-pore AAO template, indicating a new perspective of template-based nanostructuring for device functionalization.

Biography

Yong Lei is a Chair Professor at the Technical University of Ilmenau in Germany. His current research interests focuses on template-based nanostructuring, energy-related devices (sodium-ion battery, supercapacitors and PEC cells) and optoelectronic applications of functional nanostructures and surface nano-patterns. He has authored 131 papers in SCI-indexed journals and 2 patents, many of them are published in first-class scientific journals, such as *Nature Nanotechnology*, *Nature Communications*, *Journal of the American Chemical Society*, *Angewandte Chemie*, *Advanced Materials*, *Advanced Functional Materials*, *ACS Nano*, *Advanced Energy Materials*, *Energy & Environmental Science*, *Chemical Society Reviews*, *Progress in Materials Science* and *Nano Energy*. He also received a few prestigious large projects in Europe and Germany, including ERC (European Research Council) starting grant and ERC proof of concept grant, BMBF (Federal Ministry of Education and Research of Germany) and DFG (German Research Foundation).

yong.lei@tu-ilmenau.de

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