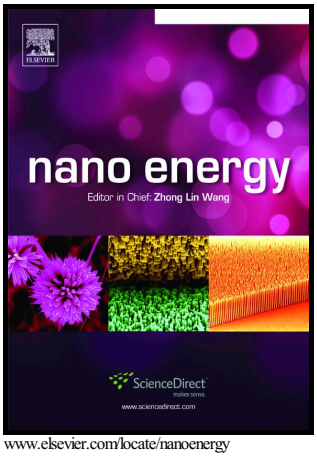

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Atomic-layer-deposited iron oxide on arrays of metal/carbon spheres and their application for electrocatalysis

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Abstract:

We construct high-performance oxygen reduction reaction (ORR) catalysts by a rational integration of metal tube (NiT), carbon spheres (CSs) and atomic-layer deposited Fe_3O_4. The preformed arrays of NiT/CSs are uniform coated by Fe_3O_4 using atomic layer deposition (ALD) technique with variable thickness. The obtained NiT/CSs-Fe_3O_4 hybrid nanoarrays have combined properties of inter-connected porous architecture (thus large surface area) and good mechanical robustness. The NiT/CSs-Fe_3O_4 arrays exhibit enhanced electro-catalytic ORR properties with higher onset potential and catalytic current than other iron oxide-based counterparts, as well as noticeable methanol-tolerance and CO anti-poisoning due to the integrated architecture and probably a synergistic coupling effect. Our result verifies the useful application of ALD in fabrication of nanostructured electrocatalysts. The developed design protocol of active materials can be extended to other hybrid arrays for applications in electrochemical energy storage and sensing.