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Monodispersed hybrid nanorattles of metal nanocore with hairy electroactive polymer shell: Synthesis and unique electrical behaviors

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A versatile template-assisted strategy for the preparation of monodispersed rattle-type hybrid nanospheres, encapsulating a movable Au nanocore in the hollow cavity of a hairy eletroactive polymer shell (Au@air@PTEMA-*g*-P3HT hybrid nanorattles; PTEMA: poly(2-(thiophen-3-yl)ethyl methacrylate; P3HT: poly(3-hexylthiophene), is reported. The Au@silica core-shell nanoparticles, prepared by the modified Stöber sol-gel process on Au nanoparticle seeds, were used as templates for the synthesis of Au@silica@PTEMA core-double shell nanospheres. Subsequent oxidative graft polymerization of 3-hexylthiophene from the exterior surface of the Au@silica@PTEMA core-double shell nanospheres allowed the tailoring of surface functionality with electroactive P3HT brushes (Au@silica@PTEMA-*g*-P3HT nanospheres). The Au@air@ PTEMA-*g*-P3HT hybrid nanorattles were obtained after etching of the silica interlayer by HF. The as-prepared nanorattles were dispersed into an electrically insulating polystyrene matrix and for the first time used to fabricate nonvolatile memory devices. As a result, unique electrical behaviors including insulator behavior, write-once-read-many-times and rewritable memory effects, and conductor behavior as well, were observed in the Al/Au@air@PTEMA-*g*-P3HT+PS/ITO (ITO: indium-tin oxide) sandwich thin-film devices.

Biography

Luxin Wang studied Materials Chemistry at the East China University of Science and Technology (ECUST) and received his BS degree from ECUST in 2012. He then joined Prof. Dr. Yu Chen's group as a PhD student. So far he has published several articles in the international peer-review journals. His present work is mainly focused on the design and synthesis of electro active functional materials for polymer memory devices.

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