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Palladium nanoparticles functionalized graphene nanosheets for Li-O_2 batteries: enhanced performance by tailoring the morphology of discharge product LIANGJUN WANG, WEI CHEN, National University of Singapore, SSL TEAM — Lithium oxygen (Li-O_2) batteries represent a promising candidate for the next generation electric vehicle.[1−3] Despite the attractive prospect, some issues including large overpotentials, poor recyclability and unstable electrolyte[4−6] limit the wide applications of Li-O_2 batteries. Due to the insoluble and non-conductive nature of discharge product Li_2O_2, it has been widely accepted that the performance of oxygen evolution reaction (OER) process is not only determined by the catalyst itself but also close linked to morphology and electronic conductivity of Li_2O_2 formed during oxygen reduction reaction (ORR) process. Herein, we report a strategy to improve the battery performance by tailoring the morphology of discharge product. By using graphene nanosheets (GNSs) functionalized with Pd nanoparticles (NPs) as cathode catalyst, the growth and morphology of the discharge products of Li_2O_2 can be effectively tailored, thereby leading to the improved Li-O_2 battery performance. Surprisingly, on bare GNSs cathode, the discharge product showed widely observed large-sized toroidal morphology. While for Pd NPs functionalized GNSs, the discharge product was homogenously distributed on the cathode in the form of small nanoparticles with an average diameter of ˜25 nm. As a result, Pd NPs functionalized GNSs exhibited a high discharge capacity of 7690 mAh g^{-1}. Meanwhile, the battery with tailored morphology exhibits lower charge overpotential.

Liangjun Wang
National University of Singapore

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