Supplementary Information

Kinetically Controlled Catalytic Synthesis of Highly Dispersed Metal-in-Carbon Composite and Its Electrochemical Behavior

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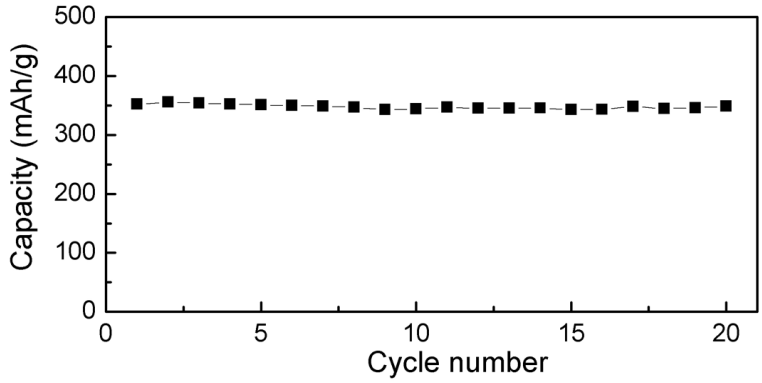


Fig. S1 Electrochemical cyclic performance of the Sn@NG composite with ~5 wt.% Sn. The composite exhibits a reversible capacity of ~350 mAh/g with stable cyclability.

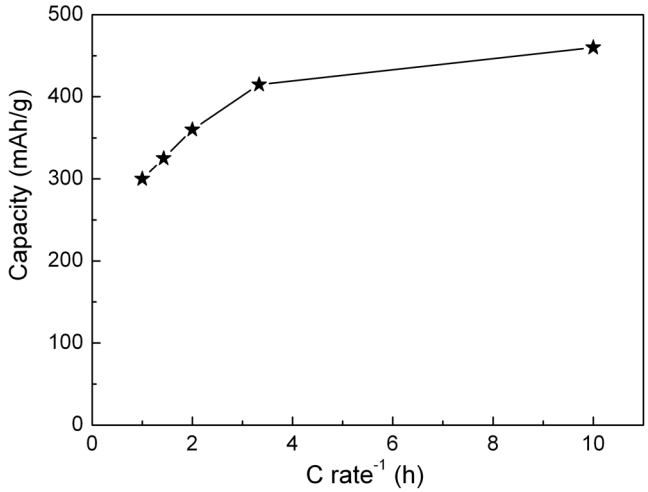


Fig. S2 Rate capability of the Sn@NG composite with ~15 wt.% Sn. The composite exhibits a reversible capacity of ~450 mAh/g at 0.1 C-rate (i.e. 10 h discharge time), ~410 mAh/g at 0.3 C-rate, ~360 mAh/g at 0.5 C-rate, ~325 mAh/g at 0.7 C-rate, and ~300 mAh/g at 1 C-rate.

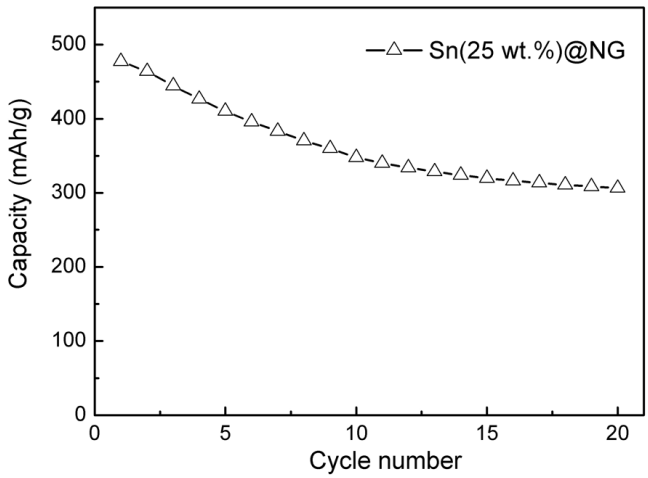


Fig. S3 Electrochemical cyclic performance of the Sn@NG composite with Sn content of ~25 wt.%.

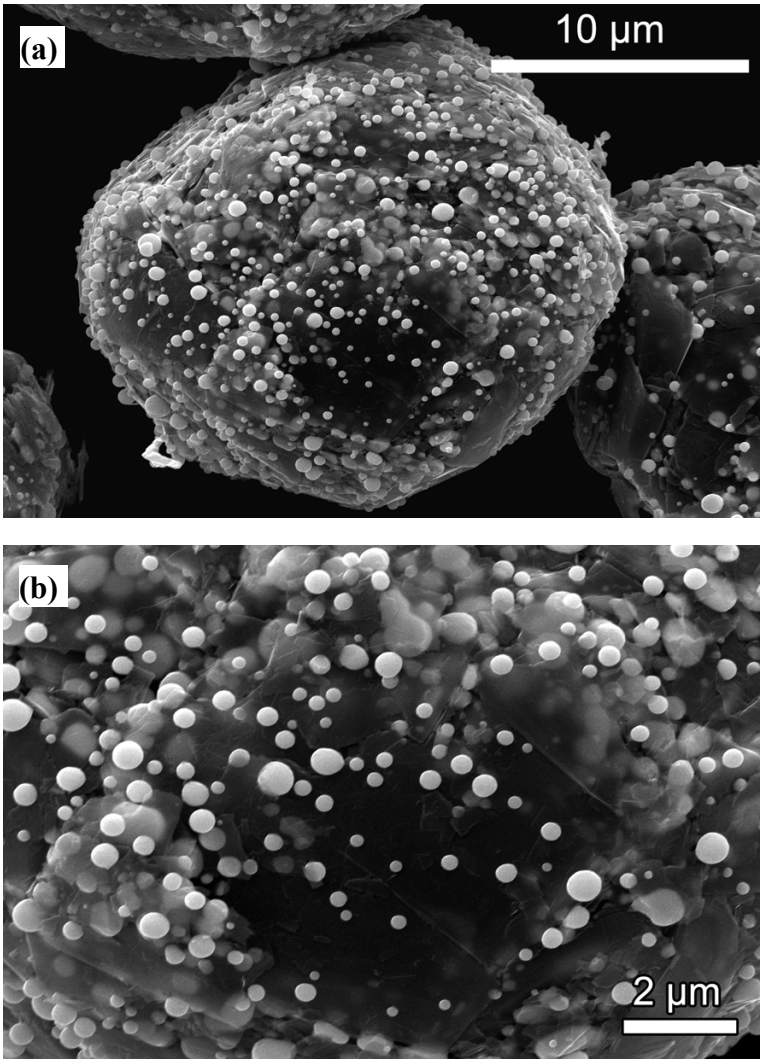
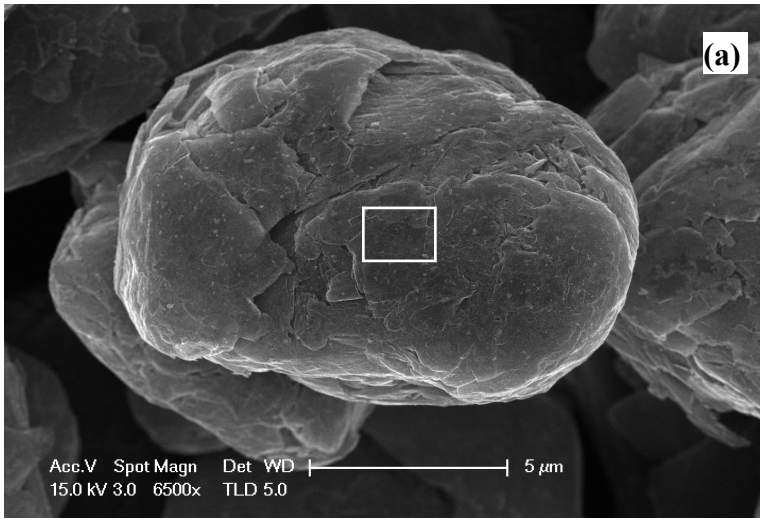
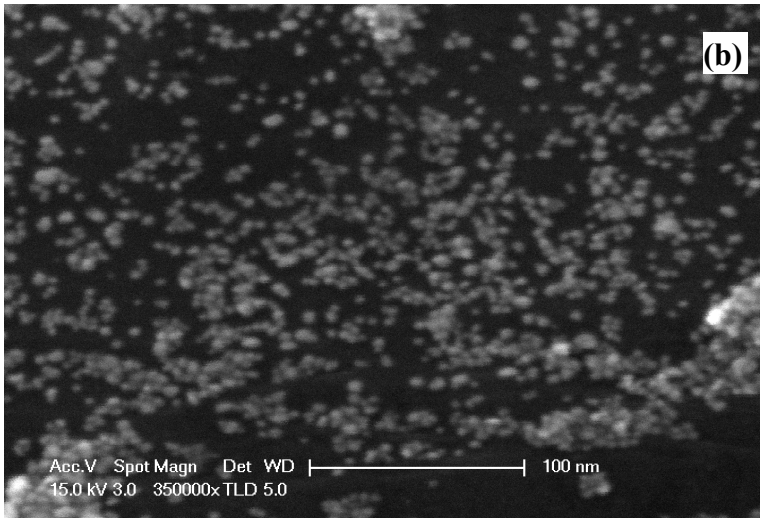
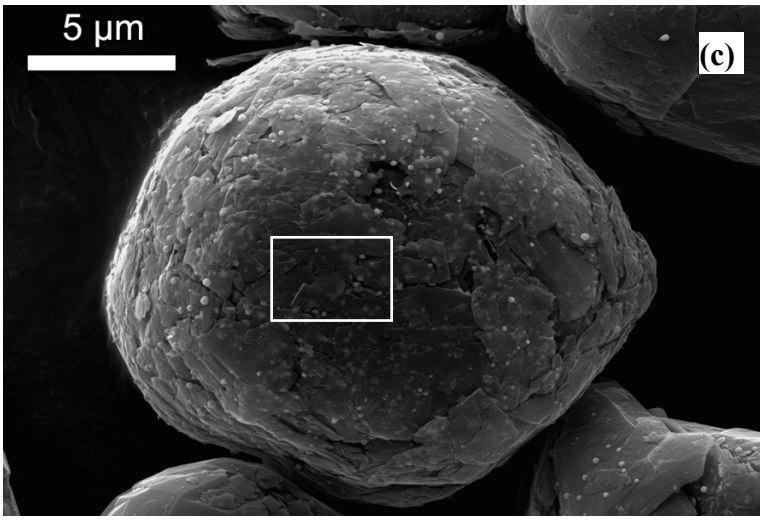


Fig. S4 (a) and (b) SEM images of the Sn@NG composite with Sn content of ~25 wt.%, showing a large proportion of Sn nanoparticles on the surface of the NG spheres.


(a)
Acc.V Spot Magn Det WD 5 μm
15.0 kV 3.0 6500x TLD 5.0


(b)
Acc.V Spot Magn Det WD 100 nm
15.0 kV 3.0 350000x TLD 5.0


5 μm
(c)

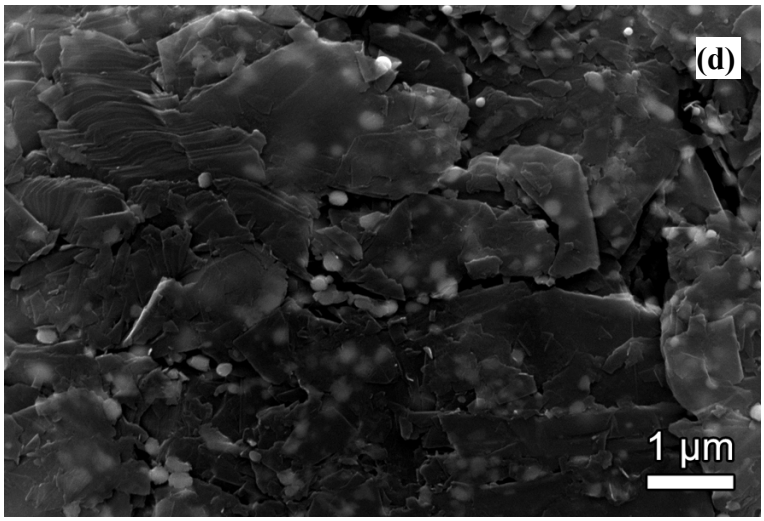


Fig. S5 SEM images under different magnifications showing the feasibility of further reducing the size of the Sn particles (< 200 nm) by tuning of the reaction kinetics. (a) and (b) the intermediate products before performing carbothermal reduction, showing that the size of the Sn oxide nanoparticles is ca. 10 nm by elaborately adjusting reaction kinetics in the vapor-diffusion catalysis; (c) and (d) the final Sn@NG composite after carbothermal reduction at 950 ^{o}C, showing that the size of the Sn particles in this composite is less than 200 nm in diameter. Moreover, the investigation on changing the conditions of carbothermal reduction (e.g. temperature and time) to reduce the coalescence and grain growth of the final Sn particles is also underway.