Electronic Supplementary Material (ESI) for Nanoscale

Supporting information for

Three-dimensional Sn-graphene anode for high-performance lithium-ion battery

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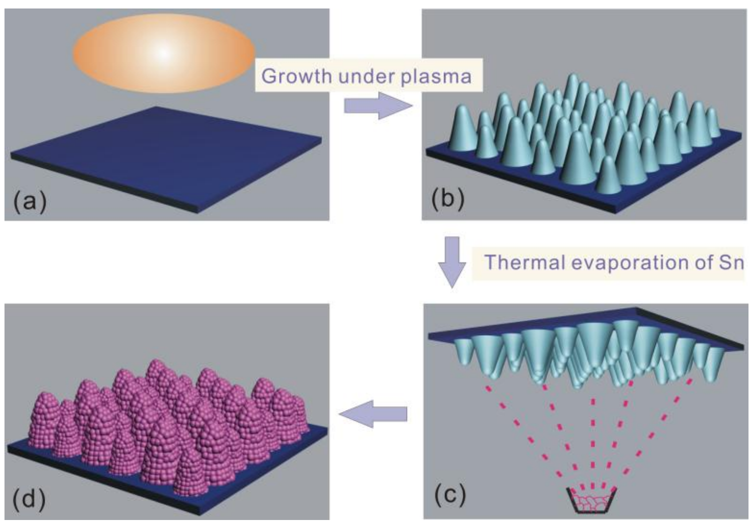

Fig. S1 Schematic procedures for preparing 3D Sn-graphene architecture. (a) A Ni foil was treated with MPCVD in CH_4/H_2 mixture atmosphere; (b) 3D foothill-like graphene scaffold was gown atop the Ni foil; (c) thermal evaporation of Sn onto the 3D foothill-like graphene surface; and (d) the 3D Sn-graphene electrode was finally obtained.

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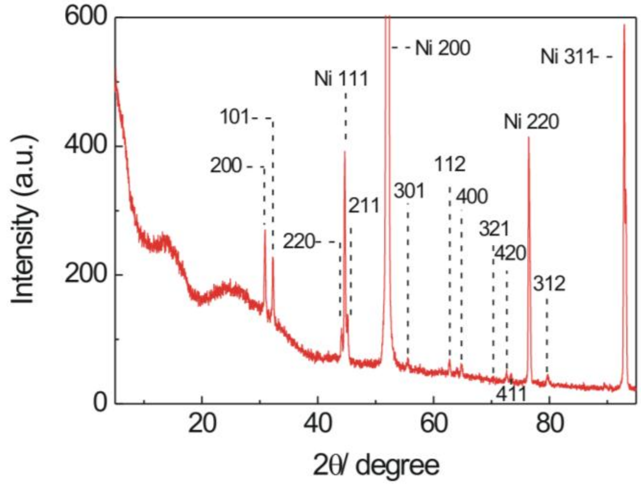

Fig. S2 XRD pattern of 3D Sn-graphene-Ni anode.

Fig. S2 shows the XRD pattern of 3D Sn-graphene-Ni anode. In addition to diffraction peaks of Ni (substrate), strong peaks located at ~32^{o}, 45^{o} and weak peaks at 55^{o}, 63^{o}, 65^{o}, for Sn are observed, which, in consistence with the SAED observation shown in Fig. 1(d), further verifies the polycrystalline nature of the thermally evaporated Sn. Moreover, a broad peak centered at 25^{o} is also revealed, which could be assigned to the 3D graphene.

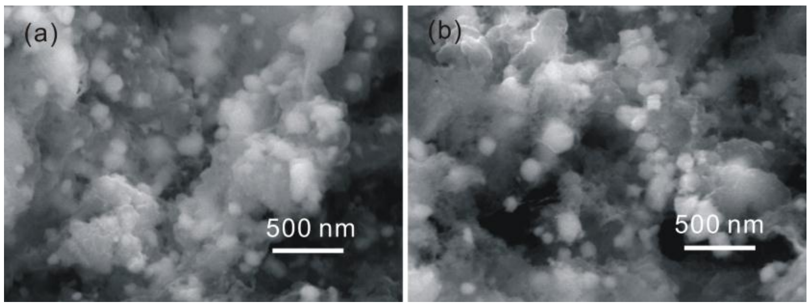

Fig. S3 45^{o} tilted SEM images of two selected regions of 3D Sn-graphene after 400 cycles at a current density of 1/3 C (293 mAg^{-1}).

Fig. S3 demonstrates 45^{o} tilted SEM images of two selected regions in the surface of 3D Sn-graphene after 400 cycles at a current density of 1/3 C (293mAg^{-1}). Sn nanoparticles are in the range from 50 nm to 250 nm, and are still tightly anchored on the graphene surface. It is also worth noting that 3D foothill-like structure of graphene cannot be viewed anymore. These observations support our suggestion that the 3D graphene may act as a flexible cushion during lithiatioin/delithiation reaction processes.