

Supplementary materials

Evaluation of the electrochemical and expansion performances of the Sn-Si/graphite composite electrode for the industrial use

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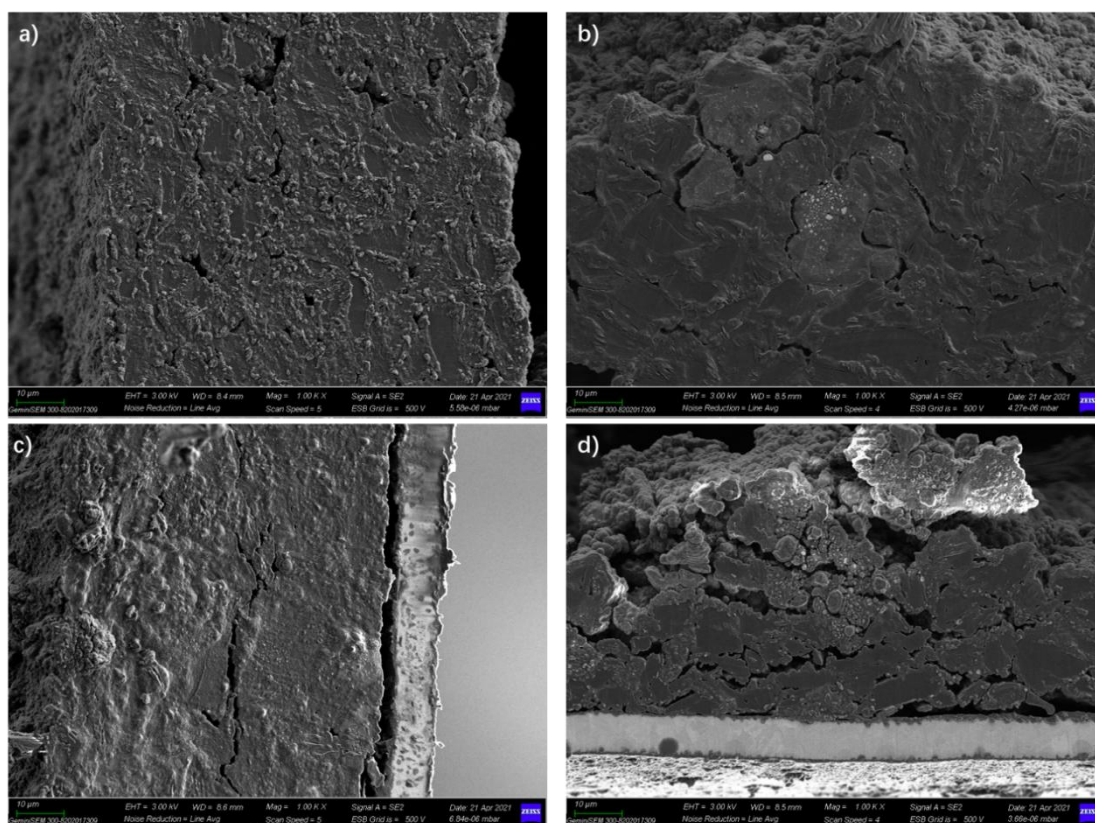


Fig.S1 SEM photos of the electrodes at lithiated state after 2 formation cycles: a) graphite; b) 5% Sn-Si; c) 10% Sn-Si; d) 20% Sn-Si

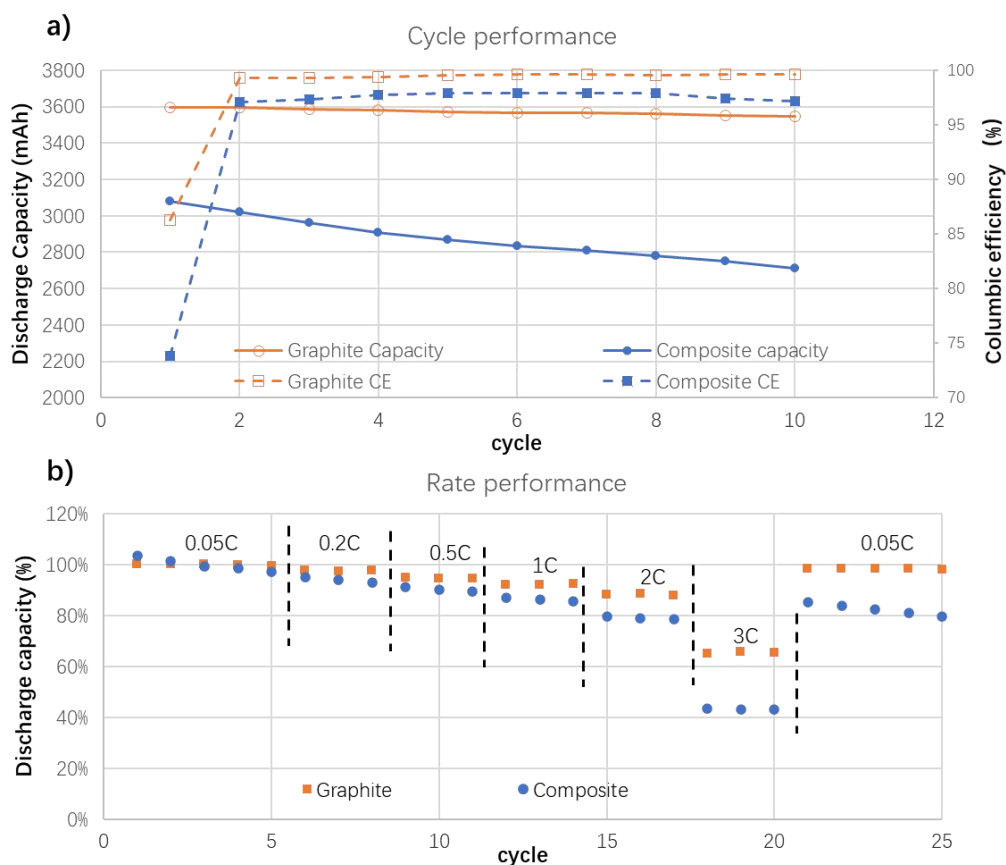


Fig.S2 The cycle performance and rate performance of the pouch cells

The extended cycle performance and rate performance have been added in supplementary material (Fig.S1 a&b).

The cycle test was stopped at 10th cycle manually because the columbinic efficiency of the Sn-Si/graphite anode is obvious not as good as graphite anode in pouch cells, which is the reason why the authors believe longer cycle test is not highly necessary. Although the cycle performance is not a big advantage for the as-elaborated Sn-Si/graphite here, which is a fact currently for alloy-type anode in both industry and academy, the overall performance of the Sn-Si/graphite anode, such as the 1st CE (75%), the reversible capacity (450mAh/g), the anode energy density (4.2mAh/cm²), together with the cycling performance (98% CE), is still a progress for the alloy-type material to be used as anode. Indeed, there are many research articles that claim long cycle performance of some alloy materials, but many of them either consider no energy density effect (anode ED less than 2mAh/cm², impossible for industry use), or exhibit quite low 1st CE or reversible discharge capacity, making the real application of such materials to be rather difficult.

The rate performance of the as-elaborated Sn-Si/graphite is compared to that of graphite in Fig.S1b). It could be seen that the composite anode has higher capacity

loss with higher charge/discharge rate, compared to graphite. The reason might be the worse electrical conductivity of the Sn-Si powder than that of the graphite powder (Fig.S2). Future solution to improve the electrical conductivity of Sn-Si powder is highly needed, for example by improving the amount of the more electrically conductive Sn within Sn-Si binary powder.

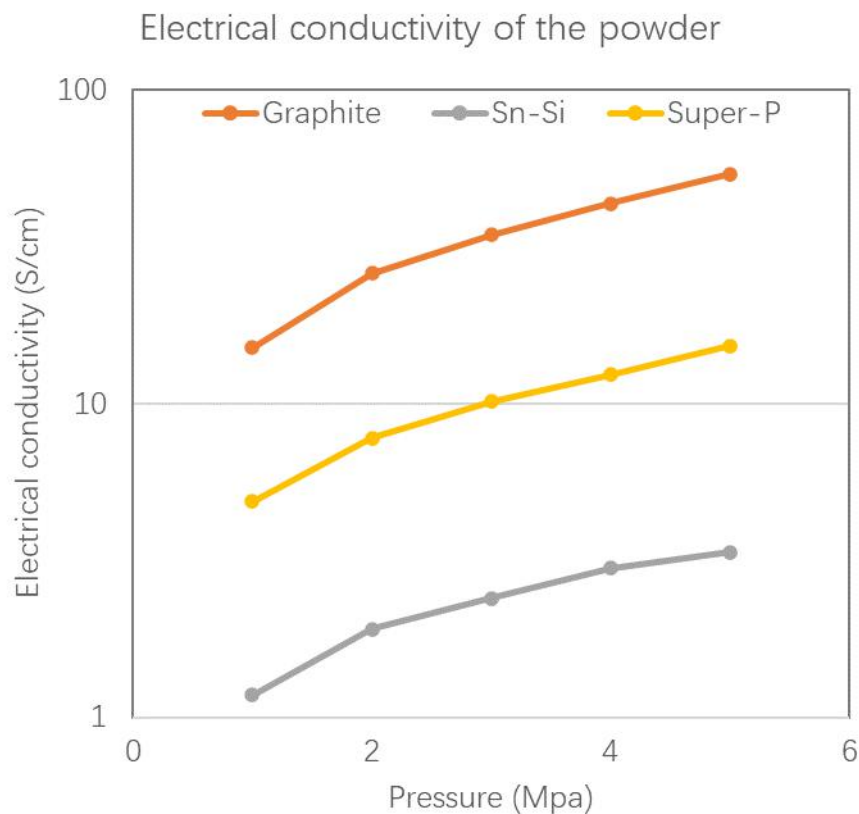


Fig.S3 The electrical conductivity comparison between the graphite, Sn-Si and super P powder