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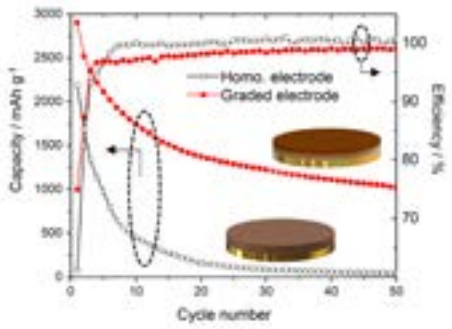
## Improving electrochemical performance of Si-based electrode via gradient Si concentration

**Zhenbin Guo, Limin Zhou** and **Haimin Yao**
The Hong Kong Polytechnic University Shenzhen Research Institute, China

Silicon (Si) has long been regarded as one of the most promising anode materials for the next-generation lithium-ion batteries (LIBs) due to its exceptional specific capacity and apt working voltage. However, the dramatic volume change of Si during lithiation/delithiation processes leads to the delamination between the current collector and the electrode materials, resulting in the poor stability and degradation of electrochemical performance of the LIB. Inspired by the functional graded design in natural biomaterials, here we propose to solve the interfacial delamination problem by graded electrode in which the Si composition is distributed in a graded way. The prepared graded electrodes especially those after gradient optimization are found quite successful in alleviating the interfacial delamination, resulting in higher capacity and capacity retention, higher coulombic efficiency, higher effective mass loading in comparison to the traditional ones. Such graded electrode can be applied together with other strategies for solving the large volume change problem of Si and can be easily produced by the existing manufacturing facilities of electrode. This work provides a guideline for the design and manufacture of the graded Si-based electrodes for LIBs.




### Biography

Zhenbin Guo is a year-three PhD candidate from The Hong Kong Polytechnic University. He is focused on the studies on bioinspired mechanics and materials and has published 7 papers in this field during his PhD study. Recently, his research interest has been extended to the mechanical behavior of anode materials for LIBs. The idea of using gradient strategies to improve the performance of LIBs is inspired by previous studies in both areas.

evin.guo@connect.polyu.hk