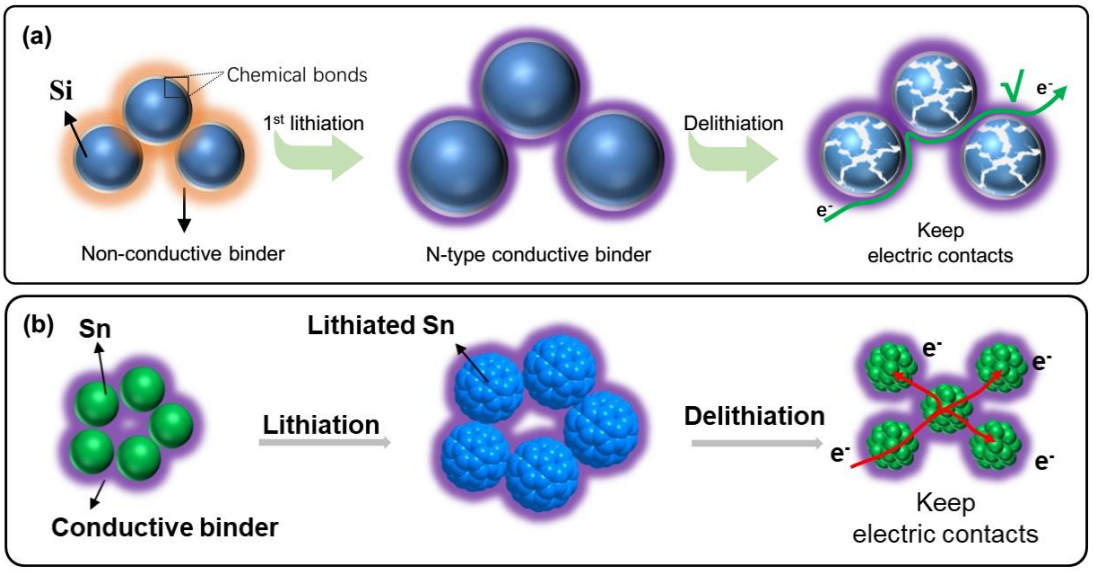
Conductive Binder for high-capacity anode materials in lithium ion batteries

Yan Zhao and Feng Pan
School of Advanced Materials, Peking University Shenzhen Graduate School, Shenzhen, China

E-mail: zhaoyan@pkusz.edu.cn

Herein, one novel conductive binder to improve the cycling performance of high-capacity anodes is presented. The binder possesses n-type polyfluorene chains and abundant carboxyl groups. The n-type polyfluorene backbones significantly promote the electronic conductivity under the reducing environment for anodes and abundant carboxyl groups in the binder can determine its solubility in water. When used in Si anode, the carboxyl groups can react with polar hydroxyl groups on the Si particles to form strong chemical bonds.[1] Thus, such a conductive binder can maintain mechanical integrity and good electronic conductivity of the whole electrode to ensure excellent electrochemical performance despite repeated charge/discharge processes (shown in **Scheme 1**).

Furthermore, similar conclusion could be seen in Sn anodes using this binder. It is found that this conductive polymer could form a conductive network, which maintained the mechanical integrity during the repeated charge and discharge processes despite the inevitable Sn particle pulverization (shown in **Scheme 1b**).[2] Besides, it is also found that the conductive binder enhanced the formation of stable solid electrolyte interphase (SEI) layers.



Scheme 1. Schematic illustrations of (a) Si and (b) Sn anodes in the processes of lithiation/delithiation.

References:

[1] D. Liu, Y. Zhao, R. Tan, L-L, Tian, Y.D. Liu, H.B. Chen, F. Pan, Nano Energy 36 (2017) 206-212.
[2] Y. Zhao, L.Y. Yang, D. Liu, J.T. Hu, L. Han, Z.J. Wang, F. Pan, ACS Appl. Mater. Interfaces 10 (2018) 1672-1677.