Materials

A Bottom-up Strategy to Prepare New Carbon Rich Materials

Energy is the key to our future. Whether to the production, storage or use of energy, carbon materials could provide a good solution. They are closely related to people's daily life and regarded as one of the most promising candidates for the flexible electrodes in energy storage devices.

Recently, a research team from the Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences prepared a well-defined two-dimensional carbon rich materials named "chlorine substituted graphdiyne" (Cl-GDY) via some chemical method, which implied a more efficient way to introduce hetero atoms into carbon materials compared to the post-treating method.

Calculation results indicated that the chlorine atoms were homogeneously distributed in the two dimensional molecular plane, which would stabilize the Li atoms intercalated in the Cl-GDY framework, and thus generated more storage sites. The Cl-GDY film on copper foil was explored as an anode material in practical LIBs, which achieved a highly improved reversible capacity of 1150 mA h g^{-1} at current density of 50 mA g^{-1} and a stable specific capacity around 500 mA h g^{-1} for 500 cycles at the current density as higher as 2 A g^{-1} in lithium ion half cells.

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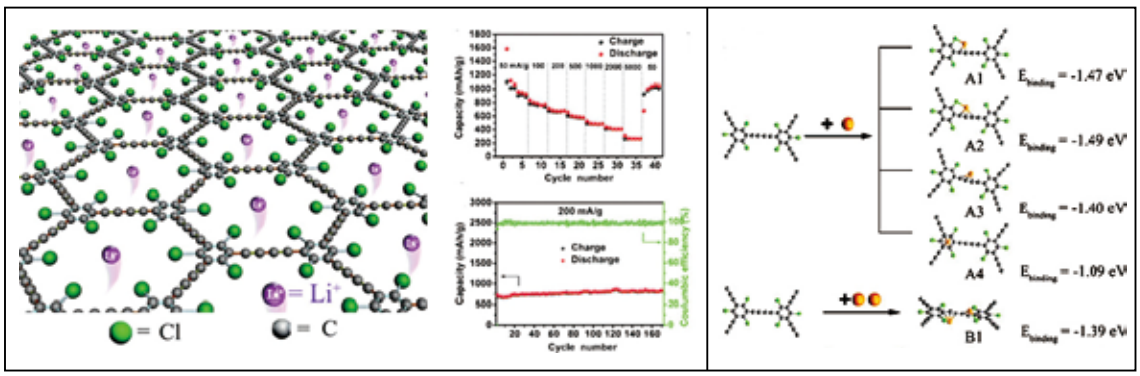

(**Left**) The structure of Cl-GDY and its application in Lithium-ion battery; (**right**) the geometries and formation energies ($E_{binding}$) of four optimized $Li+C_{28}Cl_6$ (A1-A4) complex and one optimized $2Li+C_{28}Cl_6$. (gray circles: C; green circles: Cl; orange circles: Li).