A new candidate of anode materials MAX phase (Nb$_2$SnC)

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The material Nb$_2$SnC combining advantages of MXene and Sn formed by heating the mix powder of Nb, Sn and carbon black$^{1,2}$. Herein we report on the electrochemical intercalation of Li ions into Nb$_2$SnC, it displays a higher capacity than as-produced other MXenes and graphite. When tested as anode for lithium ion batteries, the charge/discharge capacity of the Nb$_2$SnC anode increases with cycling. For instance, after 600 charge/discharge cycles, the specific capacity increased from 80 mAh g$^{-1}$ to 150 mAh g$^{-1}$, at a current density of 0.5 A g$^{-1}$, and the capacity increased from 110 mAh g$^{-1}$ to 210 mAh g$^{-1}$ at 0.05 A g$^{-1}$. It is demonstrated that when Li ions intercalate into Nb$_2$SnC, the expansion of the Sn will open the layer by itself, the increasing capacity with cycling was considered evidence for the process$^3$, as confirmed by scanning electron microscopy and transmission electron microscopy. Since Nb$_2$SnC is just one of many MAX phase, this work lays the foundation for the development of the MAX phase as the anode of the lithium batteries.

Figure 1: XRD patterns of Nb$_2$SnC

Figure 2: Cycling performance of Nb$_2$SnC at 500 mA g$^{-1}$

References:

