Abstract:

Sodium-ion batteries (NIBs) are emerging as one of the most promising energy storage technologies as post “Li-ion”, particularly for large-scale energy storage.[1] Among negative electrodes candidate materials, hard-carbon is very attractive for practical battery due to its high capacity as 250 mAh g\(^{-1}\), long cycle life, and low cost.[2] In this work, using argan shells as raw materials, hard-carbon is prepared through a carbonization approach followed by high-temperature treatment (HTT). Raw material of argan seed shell was milled thoroughly, and the argan shell powder was heat-treated at 1000, 1200, and 1300 °C in Ar to prepare hard-carbon. The hard-carbon electrodes were tested in Na cells.[3] The electrodes showed a first discharge capacity as high as 300 mAh g\(^{-1}\) (Figure 1) at a current rate of 25 mA g\(^{-1}\) with a stable cyclic life around 99.8% of capacity retention after 20 cycles. An origin of high-capacity will be discussed from characterization of the hard-carbons synthesized by different HTT. Further investigations on argan-derived hard-carbons to improve its overall electrochemical performance (capacity, cyclability, coulombic efficiency, and voltage profile) are being carried out, including the effect of binders, electrolyte dependency and so on. To summarize analytical analysis and electrochemical results, we will discuss the potential of argan-derived hard-carbons as the inexpensive and environmentally friendly electrodes in NIBs.

Figure 1: Charge-discharge curves of hard-carbon derived from argan by carbonization at 1000, 1200 and 1300 °C.

References
Contribution: Invited ☑ Oral ☒ Poster ☐