Carbon derived from corncobs for composite cathode materials for Li-S batteries

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Sulfur is a promising cathode material because of its high theoretical capacity of 1675 mAh/g and cost effectiveness. However, the electrochemistry of Li-S batteries involves noticeable problems that limit the practical application. Poor electronic and ionic conductivities along with series of structural and morphological changes in sulfur during the charge-discharge process result in unstable electrochemical contact within electrodes.[1]

A strategy to improve the electrochemical performance of the sulfur cathode is to prepare it as composite with carbonaceous materials; nevertheless, the optimization of the carbon structure and the development of simple and inexpensive fabrication techniques are still needed.[1] In this work composites of sulfur and carbon derived from biomass with unique structures such as corncobs, will be evaluated to be used as cathode materials in Li-S batteries.

First results of the preparation of corncob carbon show a hierarchical pore distribution, mainly between 0.7-4.6 nm, representing micropores and small mesopores (Fig. 1a). The BET surface area and pore volume are 1341 m^2/g and 1.08 cm^3/g, respectively; with an average pore diameter of 3.24 nm. The developed porous structure could be favorable for the confinement of sulfur and polysulfides formed. On the other hand, Raman spectroscopy analysis shows two obvious peaks around 1321cm^{-1} and 1585 cm^{-1} (Fig. 1b), which correspond to the D-band and G-band of carbon. The D-band is only present when there is disorder, and the G-band is an indication of graphite-like order. Almost equal intensities of D and G peaks indicates a partial graphitic character of the sample; thus a relatively good conductivity is expected.

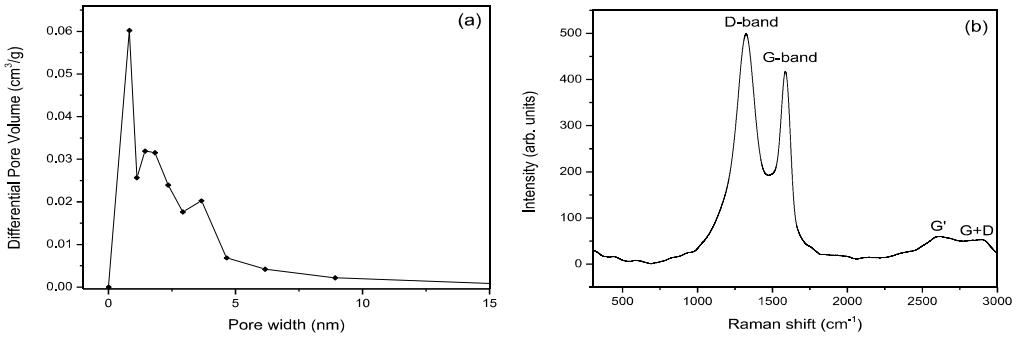

Fig. 1: (a) BJH pore size distribution curve and, (b) Raman spectrum of corncob carbon.

References

[1] Y. Yin, S. Xi, Y. Guo, L. Wan, Angewandte Chemie, **52** (2013) 13186-13200.

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