Electrochemical Performance of $LiCoPO_4$/C Composites Prepared from Various Carbon Sources by Using a Combination of Aerosol and Powder Technologies Followed by Heat Treatment

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This work has focused attention on cathode material $LiCoPO_4$ with a theoretical capacity of about 167mAh g^{-1}, thanks to its high energy density and superior thermal stability. However, it has poor electronic and ion conductivities [1]. In order to improve them, methods such as spray pyrolysis, wet ball milling with various carbon sources and freeze drying were applied to synthesize $LiCoPO_4$/C composites.

Firstly, the precursor solution was prepared by dissolving LiH_2PO_4 and $Co(NO_3)_2 \cdot 6H_2O$ into distilled water as a molar ratio of 1:1. Then, spray pyrolysis was operated at 400℃ to obtain precursor, which was mixed with carbon source, such as Citric acid(CA), Tartaric acid(TA), Ascorbic acid(AA), Sucrose(SC), Polyvinyl alcohol(PVA) and Polyvinyl pyrrolidone(PVP) by wet ball milling. After the mixture was annealed at 700℃ for 4 h in Ar atmosphere, $LiCoPO_4$/C composites were obtained.

Fig. 1 shows the XRD patterns of $LiCoPO_4$/C synthesized by spray pyrolysis at 400℃ and a combination of wet ball milling and heat treatment at 700℃ for 4h in Ar atmosphere, using different carbon sources. It can be confirmed that all peaks of the samples are mainly indexed to olivine structure with a *Pnma* space group, except weak impurity peak of Co_2P in samples using SC, PVA and PVP as carbon sources. The further data and figures in detail will be displayed during the presentation of symposium.

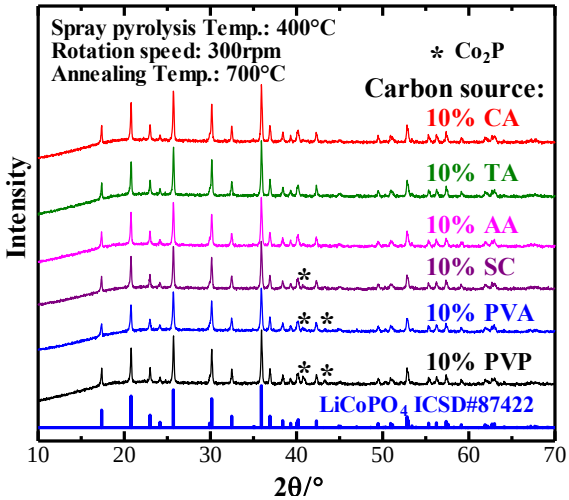

Figure 1. XRD patterns of samples prepared by spray pyrolysis at 400℃ and a combination of wet ball milling and heat treatment at 700℃ for 4h in Ar atmosphere, using various carbon sources.

References:

[1] J. Ludwig, C. Marino, D. Haering, C. Stinner, H. A. Gasteiger, T. Nilges, *J. Power Sources.* 342 (2017) 214–223.