HIGH PERFORMING SUPERCAPACITOR COMBINING POROUS CARBON ELECTRODES AND A HYDROGEL ELECTROLYTE

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Nowadays, commercial capacitors employ porous carbon as electrode with liquid electrolytes. Yet, these latter ones might present some leakage and corrosion issues. That is why much work is dedicated to search for alternatives such as gel and solid like electrolytes. They permit a good capacitor performance while suppressing these safety concerns at the same time. The good adhesion between porous carbon and gel electrolytes makes them good candidates for promising safe capacitors. In this context, developing a gel electrolyte to be used with porous carbon is an interesting strategy. In this work, chitosan is proposed as a low cost natural polymer to host KOH electrolyte via a simple synthesis method involving the cross-linking with glyoxylic acid. Then, by a drop cast technique the gel is formed and the chitosan-KOH gel electrolyte is cut in a circular shape (inset Fig. 1) and used with porous carbon.[1] The symmetric carbon capacitors show better performance than liquid 2 M KOH in some conditions. Moreover, the operational voltage window for this device can be extended until 1.3V with the alkaline chitosan-KOH gel electrolyte. The Ragone plot is calculated for the carbon capacitors using the gel electrolyte and liquid 2 M KOH at 0.8 and 1.3V and a considerable gain in the energy density can be seen at 1.3V (Figure 1). In addition to the energy density improvement the suppression of negative hazardous gas formation and liquid leakage is avoided. In a perspective, the chitosan-KOH gel electrolyte will be used with pseudocapacitive materials in order to achieve a high performance pseudocapacitor using an alkaline gel electrolyte.

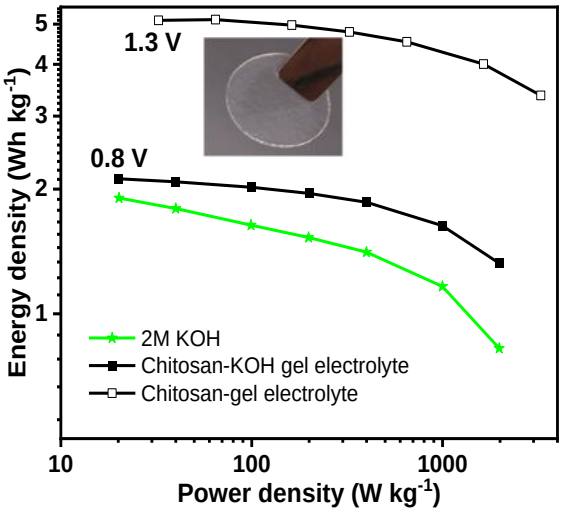

Figure 1: Ragone plot of Carbon/Carbon capacitors with chitosan-gel electrolyte and liquid 2M KOH electrolyte (inset) Photo of gel electrolyte cut and ready to insert in a two-electrode device

References

1- Zallouz S., Le Meins J.-M., Matei-Ghimbeu C., to be submitted.