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A SYSTEM FOR VACUUM HOT IMPREGNATION OF MOLTEN EUTECTIC MIXTURE IN POROUS MATERIALS FOR THE FABRICATION OF SOLID STATE SUPERCAPACITORS

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Resumo:
A system and technique for hot impregnation of a molten eutectic mixture in porous carbon materials under vacuum have been developed in the present study. In general, a deep eutectic solvent (DES) is liquid at room temperature, but under certain composition it is possible and desirable to have a DES that is solid at room temperature and liquid only when heated at 80oC or above. A liquid DES electrolyte will penetrate the pores of a high superficial area material and form the double layer capacitance. When the DES is solid at room temperature it must be heated to became liquid and impregnate the porous materials by infiltration. In order to further facilitate the penetration of this somewhat viscous electrolyte on the pores it is necessary to remove the air that is inside the pores with a vacuum pump system. In this work, a system and technique for hot impregnation of a molten eutectic mixture under vacuum have been developed and tested. Solid state electrochemical supercapacitors were produced using activated carbon electrodes and molten DES electrolytes,

with and without vacuum impregnation. These devices were electrochemically characterized by cyclic voltammetry varying the scan rate from 1 to 300 mVs-1, by galvanostatic cycle with current densities of 10 to 30 mAg-1 and by electrochemical impedance in the range of 1mHz to 100 KHz, varying the bias potential from 0V to 1V. A considerable difference in the specific capacitance has been found for the supercapacitors fabricated using hot infiltration of the molten DES.