World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:01, 2018

Three-Dimensional Carbon Foams for the Application as Electrode Material in Energy Storage Systems

Authors : H. Beisch, J. Marx, S. Garlof, R. Shvets, I. I. Grygorchak, A. Kityk, B. Fiedler

Abstract : Carbon materials, especially three-dimensional carbon foams, show very high potential in the application as electrode material for energy storage systems such as batteries and supercapacitors with unique fast charging and discharging times. Regarding their high specific surface areas (SSA) high specific capacities can be reached. Globugraphite is a newly developed carbon foam with an interconnected globular carbon morphology. Especially, this foam has a statistically distributed hierarchical pore structure resulting from the manufacturing process based on sintered ceramic templates which are synthetized during a final chemical vapor deposition (CVD) process. For morphology characterization scanning electron (SEM) and transmission electron microscopy (TEM) is used. In addition, the SSA is carried out by nitrogen adsorption combined with the Brunauer–Emmett–Teller (BET) theory. Electrochemical measurements in organic and inorganic electrolyte provide high energy densities and power densities resulting from ion absorption by forming an electrochemical double layer. All values are summarized in a Ragone Diagram. Finally, power densities up to 833 W/kg and energy densities up to 48 Wh/kg could be achieved. The corresponding SSA is between 376 m^2/g and 859 m^2/g. For organic electrolyte a specific capacity of 71 F/g at a density of 20 mg/cm^3 was achieved.

Keywords : BET, CVD process, electron microscopy, Ragone diagram
Conference Title : ICDCMT 2018 : International Conference on Diamond, Carbon Materials and Technology
Conference Location : Zurich, Switzerland
Conference Dates : January 15-16, 2018