

Waste Tea Leaves Based Hard Carbons as Anode Materials for Sodium Ion Battery

Arenst Andreas Arie^{1*}, Emrah Demir³, and Rezan Demir-Cakan^{2,3}

¹*Department of Chemical Engineering, Faculty of Industrial Technology, Parahyangan Catholic University, Ciumbuleuit 94 Bandung 40141 Indonesia*

²*Department of Chemical Engineering, Gebze Technical University, Gebze, Kocaeli, Turkey*

³*Institute of Nanotechnology, Gebze Technical University, 41400, Gebze, Kocaeli, Turkey*

*Corresponding author Email Address : arenst@yahoo.com;arenst@unpar.ac.

Abstract

In this work, hard carbons were prepared from waste tea bag powder (WTHCs) by using hydrothermal carbonization followed by the pyrolysis carbonization. It was found that WTHCs showed a sheet like morphology, a well-connected structure and a large interlayer spacing. The WTHCs were then used as anode materials for sodium ion battery. The electrochemical characterizations were examined by cyclic voltammetry (CV), galvanostatic charge discharge and electrochemical impedance spectroscopy. The best WTHC sample performed stable cycle profiles, maintaining a specific capacity of 193 mAh g⁻¹ until the 100th cycle at a current density of 100 mA g⁻¹ and capacity of 127 mAh g⁻¹ after 200 cycles under current density of 1000 mA g⁻¹. These very good performances were ascribed to the large interspacing of WTHCs, reduced carbon defect structure and sheet like morphology which can provide a large space for sodium storage and facilitate sodium ion transfer.

Keywords: Waste tea; Hard carbons; Anodes; Sodium battery; Hydrothermal carbonization