Phosphorus-Carbon Composite for a Negative Electrode of a Sodium-ion Battery

Alexander Skundin^{1,*}, Dmitry Gryzlov¹, Tatiana Kulova¹, Yulia Kudryashova^{1,2}, Anna Kuz'mina¹

¹ Frumkin Institute of Physical Chemistry and Electrochemistry of the RAS, 31-4 Leninskii ave., 119071 Moscow, Russia

² National Research University "Moscow Power Engineering Institute", 14 Krasnokazarmennaya str., 111250 Moscow, Russia.

*E-mail: askundin@mail.ru

doi: 10.20964/2020.02.47

Received: 9 October 2019 / Accepted: 19 November 2019 / Published: 31 December 2019

Phosphorus-carbon composite was prepared by combined method consisting of grinding a mixture of red phosphorus with Ketjenblack EC300J followed by sublimation-condensation with simplified temperature scenario. The composite was characterized by XRD, EDX, SEM, and Raman-spectroscopy. The electrodes with such a composite were studied by galvanostatic cycling and cyclic voltammetry. The electrodes delivered the discharge capacity of 1870 mAh g⁻¹ at C/20 and 190 mAh g⁻¹ at 10C. The sodium effective diffusion coefficient in the composite was estimated as $(3-4) \cdot 10^{-14} \text{ cm}^2 \text{ s}^{-1}$.

Keywords: sodium-ion batteries, phosphorus-carbon composites, sublimation-condensation method, sodium insertion, sodium diffusion coefficient

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).