

Nanocomposites and nanomaterials

Electrochemical synthesis, morphological and structural characteristics of carbon nanomaterials produced in molten salts.

I.A. Novoselova¹, S.V. Kuleshov¹, V.N. Bykov²

¹ *Department of Electrochemical Synthesis in Molten Salts, V.I. Vernadskii Institute of General and Inorganic Chemistry, Natl. Acad. of Sci. of Ukraine, Prospect Palladina 32/34, Kiev- 03680, Ukraine.*

² *Physical Electronics Department, Institute of Physics, Natl. Acad. of Sci. of Ukraine, Prospect Nauki, 46, Kiev – 03032, Ukraine,*

E-mail: v.bykov@iop.kiev.ua

Carbon nanomaterials (CNM) draw the increasing attention of researchers because of their prospect application in different areas of science and technique. One of the available, but not enough developed method of their synthesis is the high temperature electrochemical synthesis (HTES) in molten salts. The essence of this method is generation a condensed carbon phase on a cathode surface from liquid phase (molten salt) by electrochemical reactions [1]. The advantages of the HTES are: (1) the simplicity of hardware implementation, (2) the possibility of synthesis control by the electrolysis modes, (3) the low energy consumption for electrolysis, (4) the use of cheap precursors, (5) the possibility of carbon phase doping during the synthesis.

HTES was realized by electrolysis of salt melts (NaCl-KCl (1:1), NaCl-KCl-CsCl (0,3:0,245:0,455)), saturated by CO₂ gas under excessive pressure up to 1,5 MPa in temperature range 500-800°C on metal cathode. The produced powders were characterized by XRD analysis, TEM, SAED and Raman spectroscopy. It was found that products contain carbon nanosized particles of different forms and structures: blocks formed by small amorphous carbon particles, carbon nanotube-like objects (CNTLO) of curved form and nanofibres. Small crystalline particles of metallic and salt phases, that are situated on the surface, inside and on the ends of the tubes, has been found in carbon deposits. The origin of the impurities may be the result of the interaction of cathode (Pt) and reactor (stainless steel) material with the carbon phase that is formed and of poor powder cleaning. Correlation between product structure and yield against the electrolysis conditions and regimes were established.

1. *Novoselova I., Oliinyk N., Voronina A., Volkov S.* Electrolytical Generation of Nano-Sized Carbon Phases with Frame Structures in Molten Salts on Metallic Cathodes // *Z. Naturforsch.*- 2008.- **63a**, N. 7/8, P. 467- 474.