GRAPHENE-LIKE CARBON ELECTROCATALYST FROM ALDER WOOD CHAR

Kätlin Kaare[1], Ivar Kruusenberg[1], Aleksandrs Volperts[2], Aivars Zhurinsh[2], Galina Dobele[2], Loreta Tamašauskaitė-Tamašiūnaitė[3], Gediminas Niaura[3], Eugenijus Norkus[3]

[1]*National Institute of Chemical Physics and Biophysics, Akadeemia tee 23, 12618 Tallinn, Estonia*
[2]*Latvian State Institute of Wood Chemistry, Dzerbenes St. 27, 1006 Riga, Latvia*
[3]*Centre for Physical Sciences and Technology, Savanoriu Ave. 231, 02300 Vilnius, Lithuania*
e-mail of presenting author: katlin.kaare@kbfi.ee

In recent years, converting different biomass into carbon nanostructures has risen as an important topic in electrochemistry [1]. In this work, a novel biomass-based nitrogen doped electrocatalyst from alder wood char was synthesized.

Activated carbon (AC) was produced using chemical activation method with NaOH at 800 °C in flowing argon atmosphere. Later the AC was doped by nitrogen using dicyandiamide (DCDA) solution in dimethylformamide (DMFA). DMFA was removed in rotary evaporator and doping was performed also at 800 °C in flowing argon atmosphere. The prepared catalyst material activity towards oxygen reduction reaction was investigated in 0.1 M KOH solution employing the rotating disc electrode (RDE) method (Fig.1). Transmission electron microscopy (TEM) was used to obtain more information about catalyst surface morphology. The morphology of typical wavy few layered graphene can be seen on Fig. 2a [2]. The space between two layers is approximately 0.34 nm (Fig. 2b), which is also similar to distance between two layers in graphene-like materials (0.34 nm) [3].

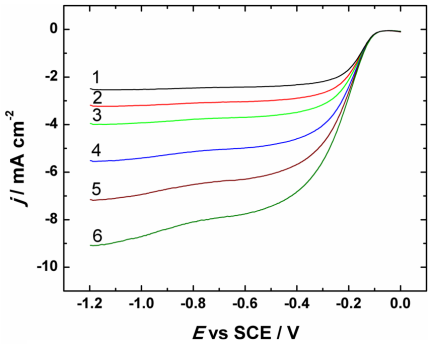

Fig. 1. RDE polarization curves for O_2 reduction on GC electrodes modified with N-doped wood-based catalyst in O_2 saturated 0.1 M KOH. $v = 10\ mV\ s^{-1}$. ω = (1) 360, (2) 610, (3) 960, (4) 1900, (5) 3100 and (6) 4600

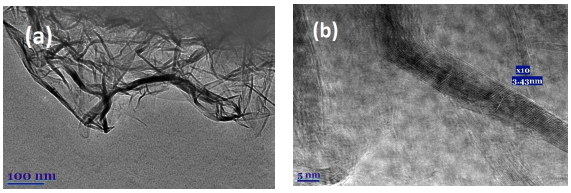

Fig. 2. TEM photos of the graphene-like wood-based catalyst material.

References

[1] M. Borghei, J. Lehtonen, L. Liu, O.J. Rojas, Adv. Mater. (2017) 1703691.
[2] Z. Wen, X. Wang, S. Mao, Z. Bo, H. Kim, S. Cui, G. Lu, X. Feng, J. Chen, Adv. Mater. 24 (2012) 5610–5616.
[3] A. Ambrosi, C.K. Chua, A. Bonanni, M. Pumera, Chem. Rev. 114 (2014) 7150–7188.

Euroopa Liit
Euroopa
Regionaalarengu Fond

Eesti
tuleviku heaks