

HETEROATOM-DOPED NANOCARBONS DERIVED FROM BLACK LIQUOR AS THE OXYGEN REDUCTION REACTION CATALYSTS

Kätlin Kaare¹, Ivar Kruusenberg¹, Aleksandrs Volperts², Aivars Zhurinh², Galina Dobeļe²,

Peter Walke³, Valdek Mikli³

¹National Institute of Chemical Physics and Biophysics, Akadeemia tee 23, 12618 Tallinn, Estonia

²Latvian State Institute of Wood Chemistry, Dzerbenes St. 27, 1006 Riga, Latvia

³Department of Materials and Environmental Technology, Tallinn University of Technology, Ehitajate tee, 19086 Tallinn, Estonia

e-mail of presenting author: katlin.kaare@kbfi.ee

The conversion of biomass into carbonaceous nanomaterials has gained a lot of attention in the recent years [1,2]. In this work, paper and pulp industry residue – black liquor – has been used to produce heteroatom-doped carbons that have been studied as oxygen reduction reaction catalysts. After chemical activation and N-doping, tri-doped (N, S and Cr) materials with high specific surface areas were achieved. The electrochemical measurements to investigate the ORR activities were conducted in alkaline media (0.1 M KOH) by using rotating disc electrode (RDE) method. Nanocarbon from black liquor that originated from Sunila (denoted as N-AC-S) pulp and paper mill showed higher specific surface area and slightly better electrochemical activity.

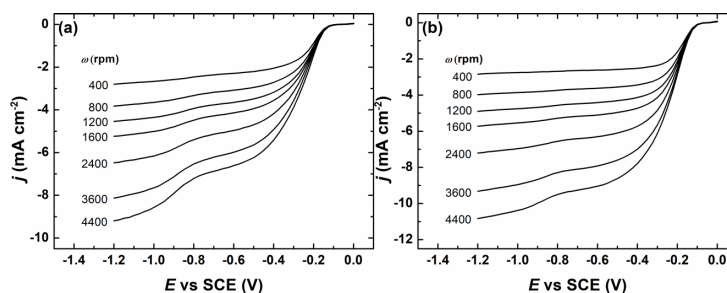


Fig. 1. RDE polarization curves for (a) N-AC-K and (b) N-AC-S at different rotation rates in 0.1 M KOH. $\nu = 2.5 \text{ mV s}^{-1}$

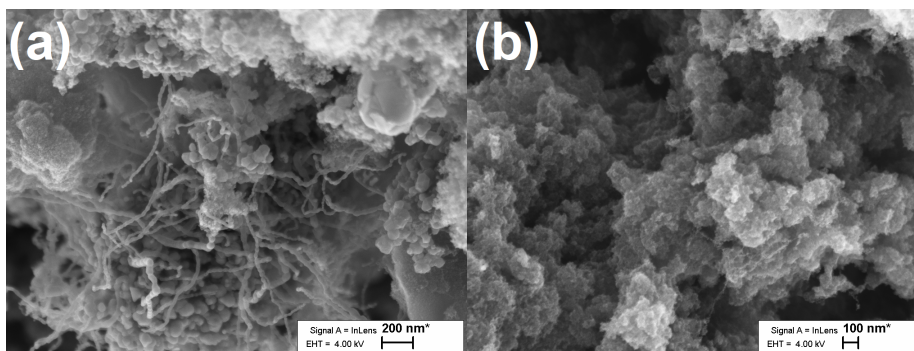


Fig. 2. SEM images of (a) N-AC-K and (b) N-AC-S.

References

- [1] M. Borghei, J. Lehtonen, L. Liu, O.J. Rojas, Adv. Mater. (2017) 1703691.
- [2] B.M. Matsagar, R.-X. Yang, S. Dutta, Y.S. Ok, K.C.-W. Wu, J. Mater. Chem. A 9 (2021) 3703–3728.