

TRANSITION METAL AND NITROGEN DOPED POLYMER DERIVED CERAMIC ELECTROCATALYSTS FOR OXYGEN REDUCTION REACTION

Marek Mooste¹, Thamires Canuto de Almeida e Silva², Elo Kibena-Põldsepp¹, Leonard Matisen³,
Maido Merisalu^{1,3}, Mati Kook³, Väino Sammelselg^{1,3}, Kaido Tammeveski¹, Michaela Wilhelm²,
Kurosch Rezwan^{2,4}

¹*Institute of Chemistry, University of Tartu, Ravila 14a, 50411 Tartu, Estonia*

²*University of Bremen, Advanced Ceramics, Am Biologischen Garten 2, IW3, 28359, Bremen, Germany*

³*Institute of Physics, University of Tartu, W. Ostwald Str. 1, 50411 Tartu, Estonia*

⁴*MAPEX Center for Materials and Processes, University of Bremen, 28359, Bremen, Germany*
e-mail of presenting author: marek.mooste@ut.ee

The increasing energy demand requires the development and optimisation of renewable energy devices. As one option for this application, fuel cell (FC) is a promising energy conversion device. Although, the slow kinetics of the oxygen reduction reaction (ORR) at the FC cathode is frequently limiting its performance. Therefore, a noble-metal free ORR electrocatalyst is needed to replace the currently employed Pt-based catalyst materials.^{1,2}

In the present work, we propose a new class of silicon oxycarbide based transition metal (Co or Ni) and nitrogen doped electrocatalysts for the ORR. The ORR performance of the catalysts is studied in acidic, neutral and alkaline environment using the rotating disc electrode (RDE) technique. The successful doping of the materials with nitrogen and transition metals was confirmed by X-ray photoelectron spectroscopy and scanning electron microscopy with energy-dispersive X-ray spectrometer analyser. The RDE results showed that the Co- and N-codoped catalyst possessed a superior electrocatalytic activity for ORR compared to the other materials in all studied media. The high ORR performance of this catalyst is attributed to the higher amount of pyridinic-N and the presence of Co-N_x centres compared to other catalyst materials prepared in the present work. This superior ORR catalyst will be further tested at the cathode in microbial FC.³

References

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