

BIFUNCTIONAL MULTI-METALLIC NITROGEN-DOPED NANOCARBON CATALYSTS DERIVED FROM 5-METHYLRESORCINOL

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High-performance bi- and trimetallic nitrogen-doped nanocarbon catalysts for the electrochemical oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) were prepared [1]. The electrocatalysts were synthesised by high-temperature pyrolysis of 5-methylresorcinol, dicyandiamide and transition metal (Ni, Fe and/or Co) salts, using carbonitrides created *in situ* from dicyandiamide as a reactive template. The electrocatalytic activity of the electrocatalysts for ORR and OER was studied using the rotating disc electrode (RDE) method in alkaline solution.

The catalyst materials showed a hierarchically porous structure, achieved through the reactive carbonitride template formed from dicyandiamide during the pyrolysis, with evenly dispersed N-coordinated transition metal active sites as well as transition metal alloy nanoparticles. The trimetallic NiFeCoNC electrocatalyst displayed excellent bifunctional ORR/OER performance with the ΔE value of 0.75 V (Fig. 1). This is attributed to the synergistic effect between transition metals in the active sites of the material and a hierarchically porous microstructure.

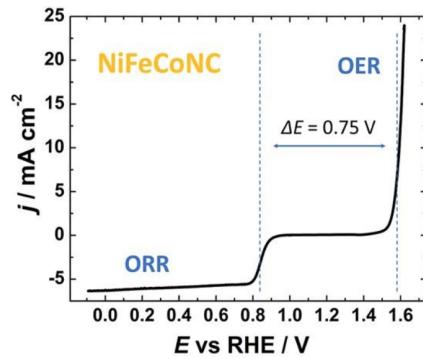


Fig. 1. RDE voltammetry curve for O_2 reduction and O_2 evolution on NiFeCoNC electrocatalyst.

References

1. K. Kisand, A. Sarapuu, A. Kikas, V. Kisand, M. Rähn, A. Treshchalov, M. Käärik, H.-M. Piirsoo, J. Aruväli, P. Paiste, J. Leis, V. Sammelselg, A. Tamm, K. Tammeveski, *Electrochim. Commun.* 124 (2021) 106932.



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