

# ORR ACTIVITY OF HEAT-TREATED Pt NANOPARTICLES SPUTTER DEPOSITED ON MULTI-WALLED CARBON NANOTUBES

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Acid-treated multi-walled carbon nanotubes (MWCNT) were coated uniformly with platinum nanoparticles by magnetron sputtering technique. Pt/MWCNT catalysts were subjected to heat treatment at different temperatures in inert atmosphere, to observe morphological changes on the surface and oxygen reduction reaction (ORR) activity of the material. Surface morphology of the prepared catalyst was studied by high-resolution scanning electron microscopy (HR-SEM). Further characterization of the catalysts was performed by electrochemical measurements like CO oxidation and cyclic voltammetry in 0.1 M KOH and 0.05 M H<sub>2</sub>SO<sub>4</sub> solutions. Rotating disk electrode (RDE) method was used to study the ORR activity of the annealed material. The ORR results of the catalysts annealed at different temperatures were compared to the one which was not annealed and also to the commercial Pt/C. It was observed that overall the annealed Pt/MWCNT catalysts show higher specific activities for ORR than the commercial Pt/C while maximum specific activity was shown by the one annealed at 300 °C. Tafel slope values confirmed that charge transfer is the rate determining step for O<sub>2</sub> reduction. The number of electrons transferred per O<sub>2</sub> molecule as calculated by the Koutecky-Levich equation was close to 4 indicating a typical 4-electron O<sub>2</sub> reduction pathway.

This work has already been published [1].

## References

[1] S. Hussain, H. Erikson, N. Kongi, M. Merisalu, P. Ritslaid, V. Sammelselg, K. Tammeveski, Heat-treatment effects on the ORR activity of Pt nanoparticles deposited on multi-walled carbon nanotubes using magnetron sputtering technique, *International Journal of Hydrogen Energy* (2017, in press).



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