INVITED ORAL PRESENTATION

Materials science in the development proton exchange membrane fuel cell components: recent trends and new results

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As the currently used Pt/C electrocatalysts are responsible for 30-40% of the price of polymer electrolyte membrane (PEM) fuel cells, intense research is focused on either replacing Pt with cheaper alternatives or decreasing the Pt load while enhancing the activity and longevity of the catalysts by suitable modification of the support. In $Ti_{(1-x)}M_xO_2$-C (M: W, Mo, Sn; x: 0.1-0.3) multifunctional supports the C backbone is responsible for the high surface area and electrical conductivity, the TiO_2 component helps in stabilizing the Pt in highly dispersed state thus offering resistance against electrocorrosion, and the dopant M provides important co-catalytic function via the bifunctional mechanism while remains protected against dissolution by the TiO_2 matrix [1-3]. In this contribution, our efforts were aimed at elucidating the effect of (i) the type of carbonaceous materials, (ii) the mixed oxide/carbon ratio and (iii) the nature of active M-Pt assemblies in mixed oxide-carbon composite supports on the electrocatalytic performance of related Pt catalysts.
Integration of novel catalysts into membrane electrode assemblies (MEAs) and building of PEM fuel cells and stacks from these MEAs for performance tests under laboratory conditions and for application in new hydrogen powered electronic devices will be demonstrated in the lecture.

Acknowledgements: This research was funded by Project no. RRF-2.3.1-21-2022-00009, titled National Laboratory for Renewable Energy has been implemented with the support provided by the Recovery and Resilience Facility of the European Union within the framework of Program Széchenyi Plan Plus.

References:

[1] D. Gubán, I. Borbáth, Z. Pászti, I.E. Sajó, E. Drotár, M. Hegedűs, A. Tompos, Applied Catalysis B: Environmental 174 (2015) 455-470.
[2] I. Borbáth, E. Tálas, Z. Pászti, K. Zelenka, I. Ayyubov, K. Salmanzade, I.E. Sajó, Gy. Sáfrán, A. Tompos, Applied catalysis A: General 620 (2021) 118155.
[3] D. Diczházi, I. Borbáth, I. Bakos, G. Szíjjáró, A. Tompos, Z. Pászti, Catalysis Today 366 (2021) 31-40.