

# CeO<sub>2</sub> /Pd-CA FOR OXYGEN REDUCTION REACTION IN ALKALINE MEDIA

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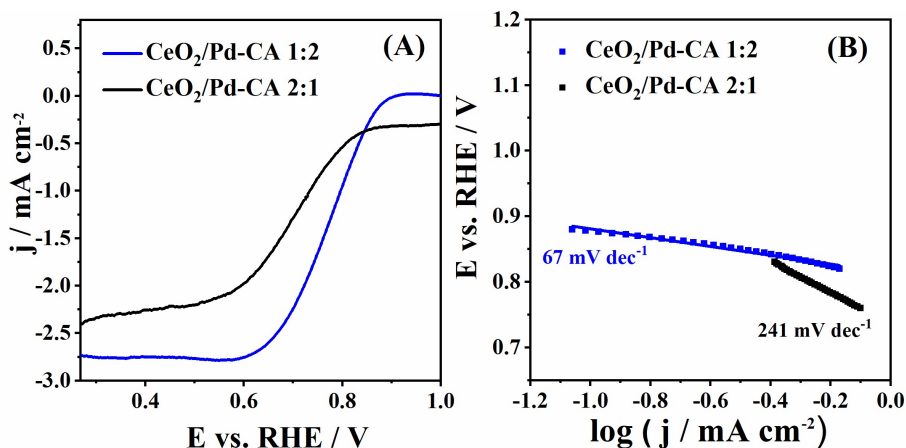
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Carbon aerogels (CAs) have recently gained recognition as highly promising materials for numerous energy and environmental applications due to their three-dimensional porous architecture, high specific surface area, ultralow density, and outstanding electrical conductivity. In oxygen reduction reaction (ORR) electrocatalysis, doped and metal-decorated CAs represent potentially cost-effective alternatives to precious benchmark catalysts, offering versatility for both two- and four-electron reaction pathways, relevant for sustainable H<sub>2</sub>O<sub>2</sub> production and electrochemical energy systems, respectively [1].

In this study, CeO<sub>2</sub> was grafted onto Pd-CA by the chemical co-precipitation method, at CeO<sub>2</sub>:Pd-CA mass ratios of 1:2 and 2:1. ORR activity of CeO<sub>2</sub>/Pd-CA materials was investigated in 1 M KOH using linear sweep voltammetry with a rotating disc electrode at 1600 rpm (**Figure 1**).



**Fig. 1.** ORR RDE curves of CeO<sub>2</sub>/Pd-CA 1:2 and CeO<sub>2</sub>/Pd-CA 2:1 in O<sub>2</sub>-saturated 1 M KOH solution at 1600 rpm and 20 mV s<sup>-1</sup> (A) with the corresponding Tafel plots (B).

Key ORR parameters, including onset potential ( $E_{\text{onset}}$ ), half-wave potential ( $E_{1/2}$ ), and Tafel slope, were determined. CeO<sub>2</sub>/Pd-CA 1:2 material exhibited superior performance, with  $E_{\text{onset}}$  of 0.87 V,  $E_{1/2}$  of 0.77 V, and a low Tafel slope of 67 mV dec<sup>-1</sup>, indicating beneficial ORR kinetics. In contrast, the composite with a 2:1 weight ratios showed slightly lower activity ( $E_{\text{onset}} = 0.83$  V,  $E_{1/2} = 0.70$  V) and a much higher Tafel slope (241 mV dec<sup>-1</sup>), suggesting slower kinetics. CeO<sub>2</sub>/Pd-CA composites exhibit promising ORR activity, with performance depending on the CeO<sub>2</sub>:Pd-CA ratio, demonstrating their potential as effective electrocatalysts for ORR.

## Acknowledgements

The authors would like to thank the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia for support through contracts no. 451-03-136/2025-03/200146 and 451-03-137/2025-03/200146, as well as Fundação para a Ciência e a Tecnologia (FCT, Portugal) for contracts LAMPET-LA/P/0095/2020-IST-ID and <https://doi.org/10.54499/UID/04540/2025>. A.N. acknowledges support provided by the Vinča Institute of Nuclear Sciences, through contract no. 451-03-136/2025-03/200017 with the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia.

[1] D. Tomić et al., "Carbon aerogels and xerogels: next-generation materials for sustainable energy and environmental solutions," *Chemical Communications*, vol. 61, no. 80, pp. 15510–15523, Jan. 2025, doi: 10.1039/d5cc02477c.