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Programme and the Book of Abstracts

**TWENTY-FIRST YOUNG RESEARCHERS' CONFERENCE
MATERIALS SCIENCE AND ENGINEERING**

Belgrade, November 29 – December 1, 2023



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ZnO@RuO₂ composites: Cost-effective trifunctional electrocatalysts for enhanced OER, HER, and ORR activities in water electrolysis

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Affordable catalysts for use in water electrolysis and fuel cells as clean energy sources pose a significant challenge. Currently, platinum group metal catalysts are both expensive and difficult to obtain. In this research, an attempt is made to address this issue by investigating methods to reduce costs. Specifically, the use of RuO₂ instead of Ru and the incorporation of a substantial amount of easily available ZnO, which has various applications, are explored.

A composite of ZnO@RuO₂ in a 10:1 molar ratio was synthesized using microwave processing of a precipitate. To enhance its catalytic properties, the composite was subsequently annealed at 300 and 600 °C. A detailed analysis of the crystal structure, morphology, optical and (photo)electrocatalytic properties of the processed 10ZnO@RuO₂ catalyst particles was conducted. The catalytic activity of the prepared composites toward the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) in 0.1 M NaOH and 0.1 M H₂SO₄ was investigated using linear sweep voltammetry (LSV). The measurements were taken both in the dark and under illumination after 60 minutes of exposure. To determine the intrinsic HER and OER activity of the studied catalyst, the LSV data were normalized by the electrochemical surface area (ECSA). Finally, the oxygen reduction reaction (ORR) activity of the catalysts was tested in both alkaline and acidic electrolytes.