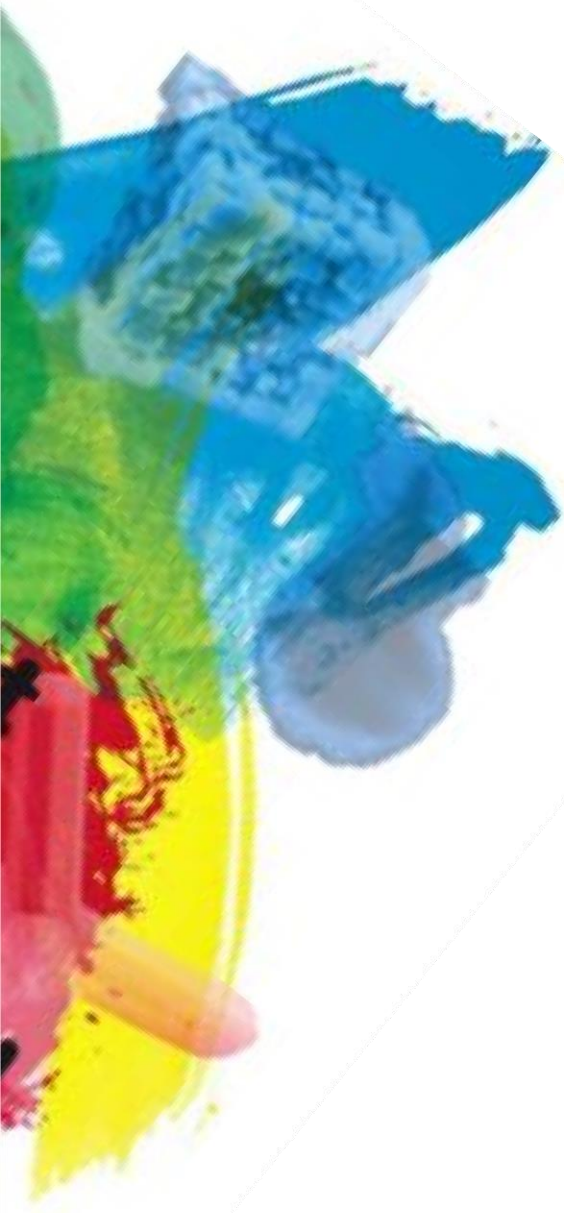
Jožef Stefan Institute
Ljubljana, Slovenia | K7 / Department for Nanostructured Materials

SEMINAR

Wednesday, 06. 09. 2023, 10.00, Kolar lecture hall

Novel synthesis of a $(CoFeNiMnCr)_3O_4$ high-entropy oxide on a CoFeNiMnCr high-entropy alloy for an oxygen-evolution reaction



Barbara Ljubec Božiček

Electrochemical water-splitting is a promising green technology for the production of hydrogen. One of the bottlenecks, however, is the oxygen-evolution half-reaction (OER), which could be overcome with the development of a suitable electrocatalyst. Recently, non-noble-metal, high-entropy oxides (HEO) have been investigated as potential OER electrocatalysts, but complex synthesis approaches limit their wider utilization. Here, a novel synthesis strategy of formulating a nanostructured $(CoFeNiMnCr)_3O_4$ HEO thin film on a CoFeNiMnCr HEA using facile electrochemical and thermal treatment methods is presented. Vacuum arc-melted CoFeNiMnCr HEA serves as favorable support to be electrochemically treated in an ethylene glycol electrolyte with ammonium fluoride to form a rough and microporous structure with nano-pits. The electrochemically treated CoFeNiMnCr HEA surface is more prone to oxidation during a thermal treatment, leading to the growth of a spinel $(CoFeNiMnCr)_3O_4$ HEO thin film. The $(CoFeNiMnCr)_3O_4$ HEO exhibits a low overpotential of 341 mV at 10 mA/cm^2, a Tafel slope of 50 mV/dec, and an unchanged surface after a long-term stability test in alkaline media. The excellent catalytic activity and stability with respect to the OER can serve as a promising platform for the practical utilization of $(CoFeNiMnCr)_3O_4$ HEO.

Kindly invited.