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Surface Reconstruction Engineering of Cobalt Phosphides by Ru Inducement to form Hollow Ru-RuP<sub>x</sub>-Co<sub>x</sub>P Pre-electrocatalysts with Accelerated Oxygen Evolution Reaction

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## Surface Reconstruction Engineering of Cobalt Phosphides by Ru Inducement to form Hollow Ru-RuP<sub>x</sub>-Co<sub>x</sub>P Pre-electrocatalysts with Accelerated Oxygen Evolution Reaction

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**ABSTRACT:** Heteroatom inducement is a possible way to tune the catalytic capability of electrocatalysts in oxygen evolution reaction (OER). In this work, we adopt a facile solid-liquid-phase chemical method to yield hollow Ru-RuP<sub>x</sub>-Co<sub>x</sub>P polyhedra. Herein, the in-situ introduced Ru can induce the surface reconstruction of Co<sub>2</sub>P into Ru-RuP<sub>x</sub>-Co<sub>x</sub>P polyhedra due to unstable surface terminations proved by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS) and Line-scan electron energy loss spectroscopy (EELS) analyses. As expected, Ru-RuP<sub>x</sub>-Co<sub>x</sub>P with large specific surface area and abundant active sites shows remarkable high OER catalytic activity ( $\eta_{10} = 291$  mV) and stability (at least 10000 cycles). DFT calculations further demonstrate that the presence of Ru metal promotes the electrocatalytic reaction kinetics through increasing the density of states at the Fermi level with reduced intermediate adsorption energy and improving electron transfer.

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