

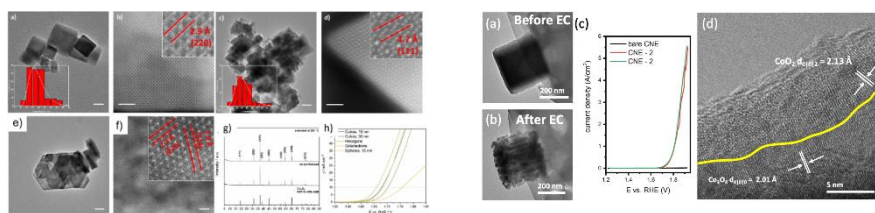
Synthesis of Mixed Metal Oxides with tailored Composition, Size, and Morphology and their Activity in OER and Thermal Oxidation Catalysis

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Perovskite- and spinel-type oxides are promising catalysts in oxygen evolution reaction (OER) and alcohol oxidation. To develop a mechanistic understanding of the reactions and to improve the activity of the catalyst, the knowledge of the solid-liquid-interphase is crucial. We will report on synthetic routes for such mixed-metal nanoparticles with defined composition, size, and shape, which may help to identify structure-property relationships. The catalytic properties of the nanoparticles both in OER and alcohol oxidation were studied in ensemble measurements, revealing the influence of the particle surface on the activity. In addition, results from single particle experiments are presented, which improve our understanding of the influence of distinct crystallographic sites on the catalytic behavior in OER.



(HR)TEM images of cubic (a, b), octahedral (c, d) and plate-like (e, f) Co₃O₄ NPs; g) PXRD of cubic Co₃O₄ NPs and h) LSV curves for different Co₃O₄ morphologies.

HRTEM images of a Co₃O₄ nanocube a) before b) after electrochemical stress test. c) Linear sweep voltammograms of two Co₃O₄@CNE nano-assemblies. d) HR-TEM image of the near-surface region of the particle shown in b).

References

C. Placke-Yan, G. Bendt, S. Salamon, J. Landers, H. Wende, U. Hagemann, S. Schulz, *Mater. Adv.* **2024**, *5*, 3482, DOI: [10.1039/D4MA00088A](https://doi.org/10.1039/D4MA00088A).

T. Quast, S. Varhade, S. Saddeler, Y.-T. Chen, C. Andronescu, S. Schulz, W. Schuhmann, *Angew. Chem. Int. Ed.* **2021**, *60*, 23444. DOI: [10.1002/anie.202109201](https://doi.org/10.1002/anie.202109201)