surfaces

MDPI

Supplementary Information

Metallic Iridium thin-films as model catalysts for the electrochemical oxygen evolution reaction OER – New Insights into Morphology, Activity and Faraday Efficiency

Ebru Özer [§,1], Zarina Pawolek [§,1], Stefanie Kühl [1], Hong Nhan Nong [2], Benjamin Paul [1], Sören Selve [3], Camillo Spöri [1], Cornelius Bernitzky [1], and Peter Strasser [1,4,*]

[1] The Electrochemical Energy, Catalysis and Materials Science Laboratory
Department of Chemistry
Technical University Berlin
Straße des 17. Juni 124
D-10623 Berlin (Germany)
E-mail: pstrasser@tu-berlin.de
[2] Max Planck Institute for Chemical Energy Conversion
Stiftstr. 34
D-45470 Mülheim (Germany)
[3] Zentraleinrichtung Elektronenmikroskopie
Technische Universität Berlin
D-10623 Berlin (Germany)
[4] Ertl Center for Electrochemistry and Catalysis
Gwangju Institute of Science and Technology
Gwangju 500-712 (South Korea)
* Correspondence: p.strasser@tu-berlin.de; Tel.: +49-(0)30-314-29542
§ These authors contributed equally.

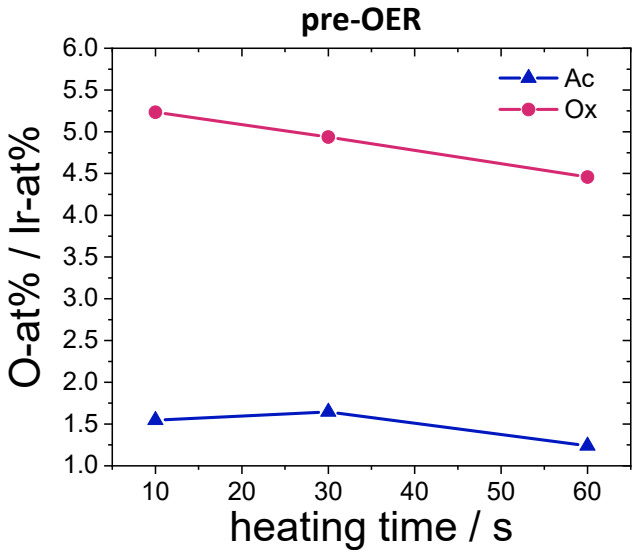

Figure S1. EDX results of _AP Ox and Ac films showing the atomic percentage (at%) ratio of O to Ir measured with 6 keV. Independent of heating time the Ox films exhibit a significant higher oxygen amount than the Ac films.

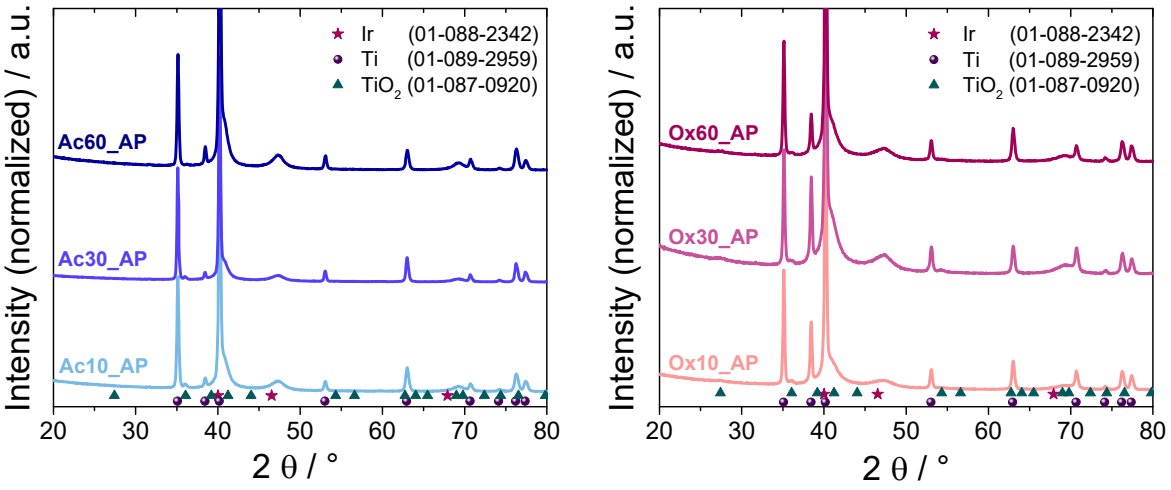

Figure S2. X-ray diffraction (XRD) of the as-prepared Ac and Ox films (_AP) show no major changes in the crystal structure in dependence of heating time. The large reflections can be attributed to the rutile phase of Ti.

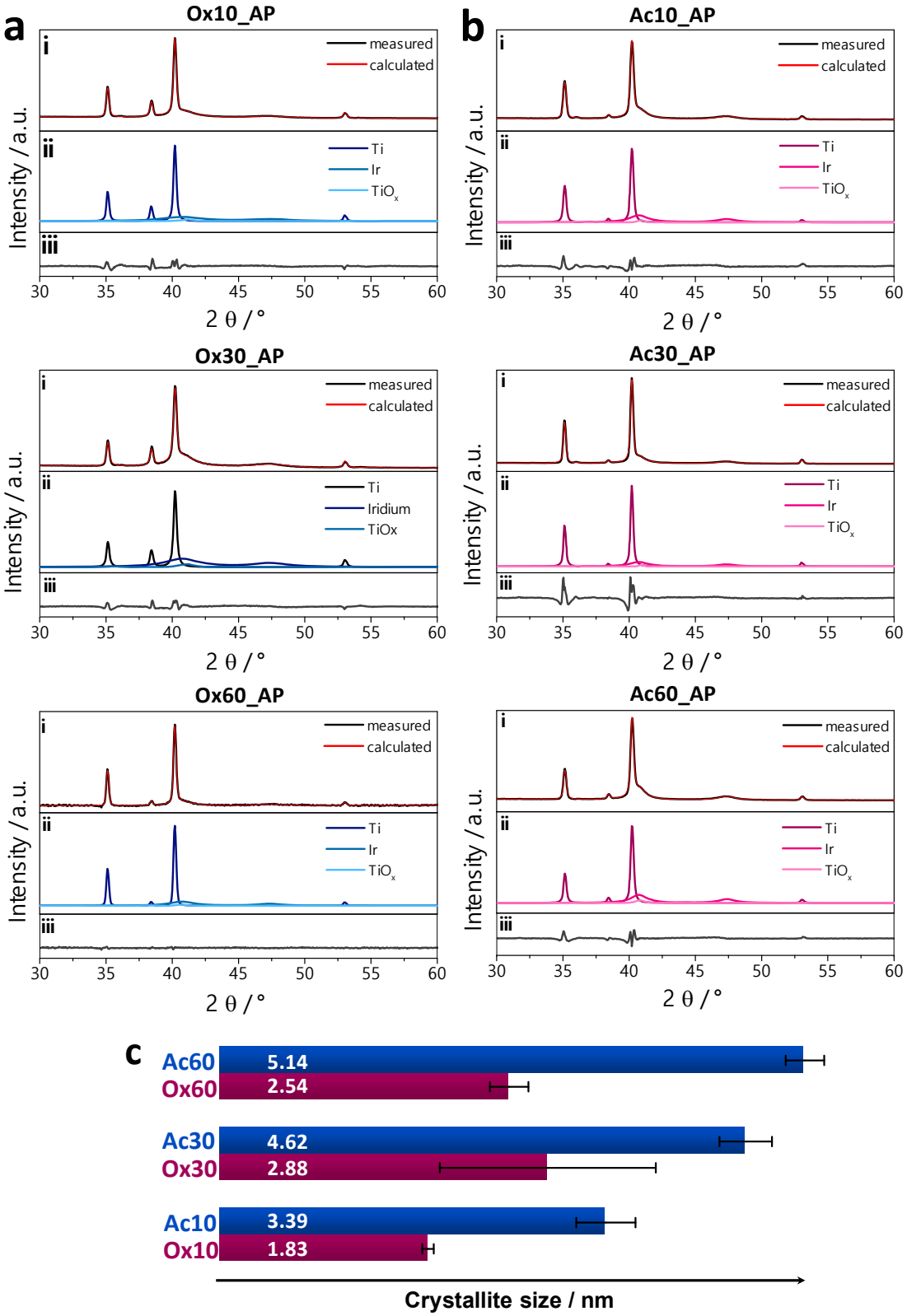

Figure S3. Grazing incidence X-ray diffraction measurement of _AP Ox **(a)** and Ac **(b)** samples on Ti substrate with (i) measured and calculated diffraction pattern from Rietveld refinement results. (ii) The Ti, Ir and TiO_x phases, which were used within the refinement. (iii) The difference between measured and calculated diffraction pattern. **(c)** Crystallite sizes of _AP samples obtained by quantitative Rietveld analysis are given in white in the respective bar.

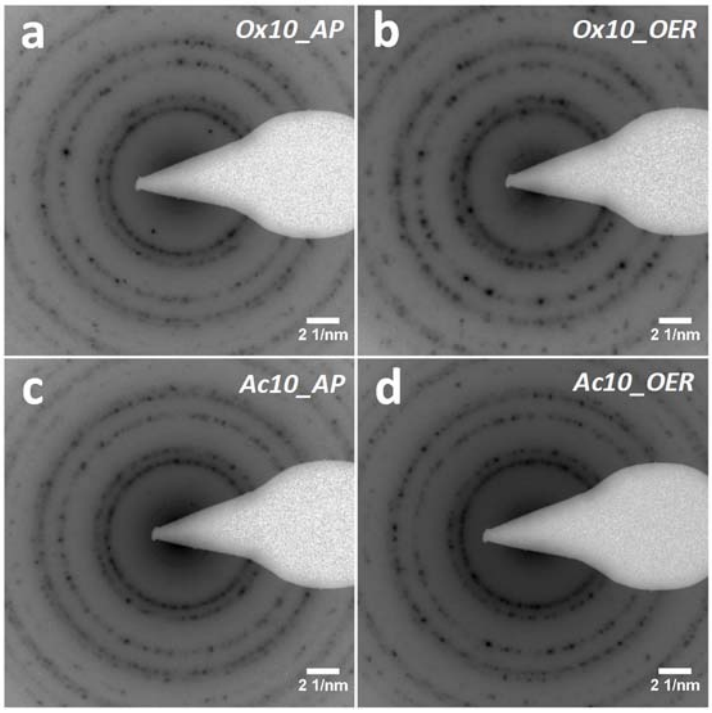

Figure S4. Selected area diffraction (SAED) images of the scraped _AP and _OER films of (**a**) Ox10_AP, (**b**) Ox10_OER, (**c**) Ac10_AP and (**d**) Ac10_OER.

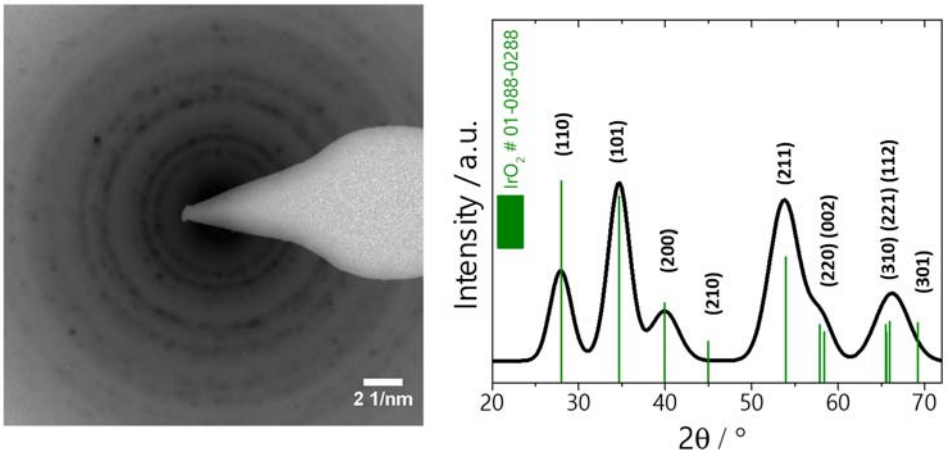

Figure S5. SAED and evaluated diffraction pattern of an IrO_x film reveals a rutile-type phase.

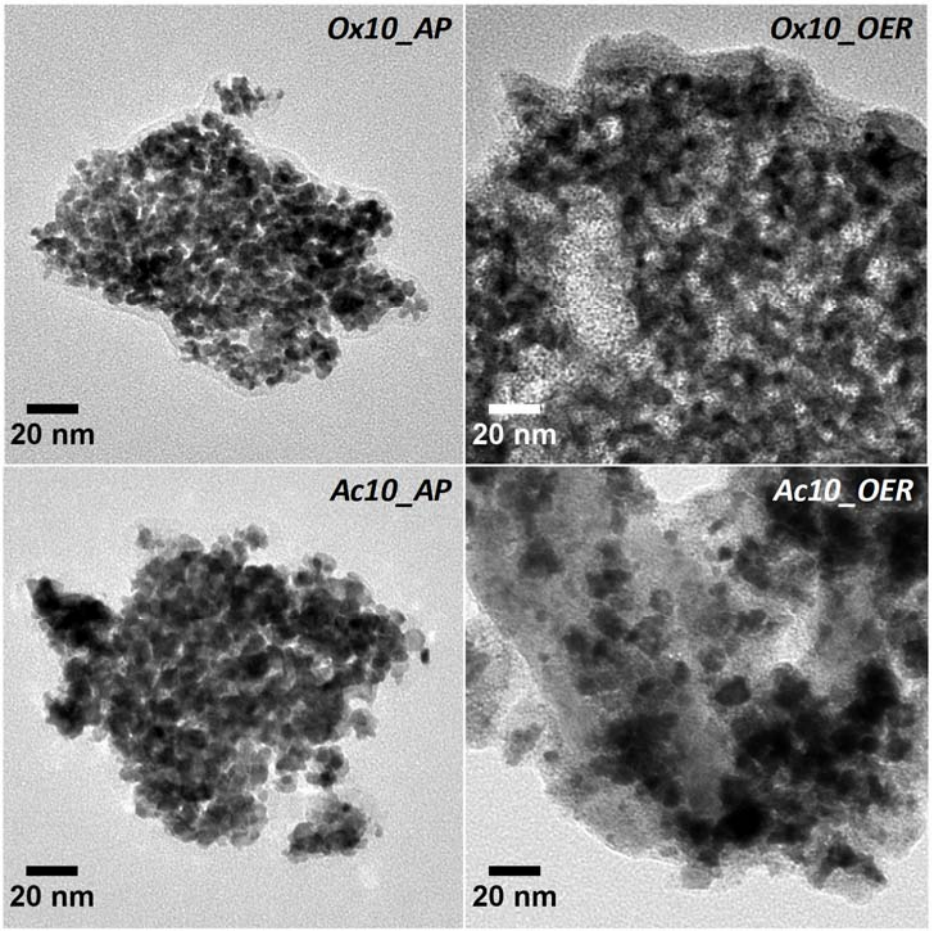

Figure S6. TEM images of the scraped _AP and _OER films displaying crystalline Ir particles.

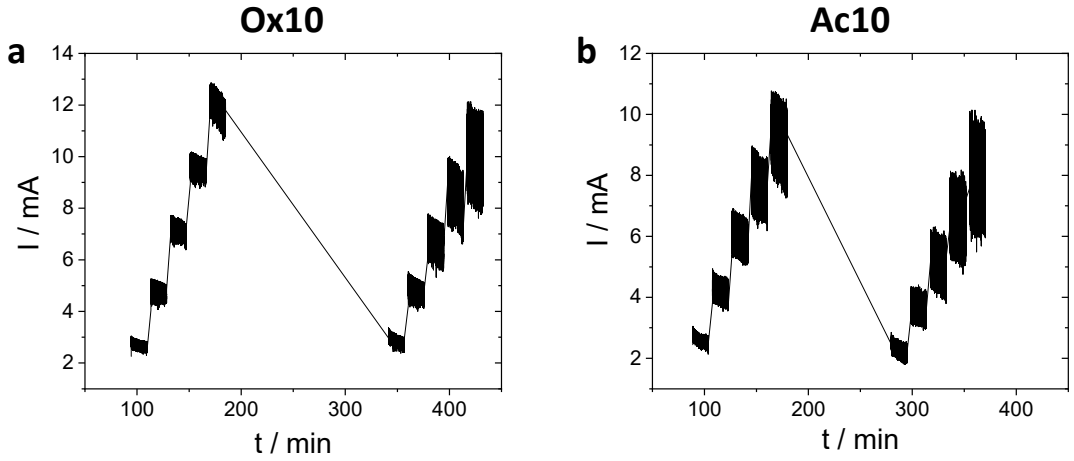

Figure S7. Stepped potential voltammetries (SPVs) exemplarily shown for Ox10 and Ac10. The non-stationary behavior of the potential steps may be caused by instabilities of the catalyst.

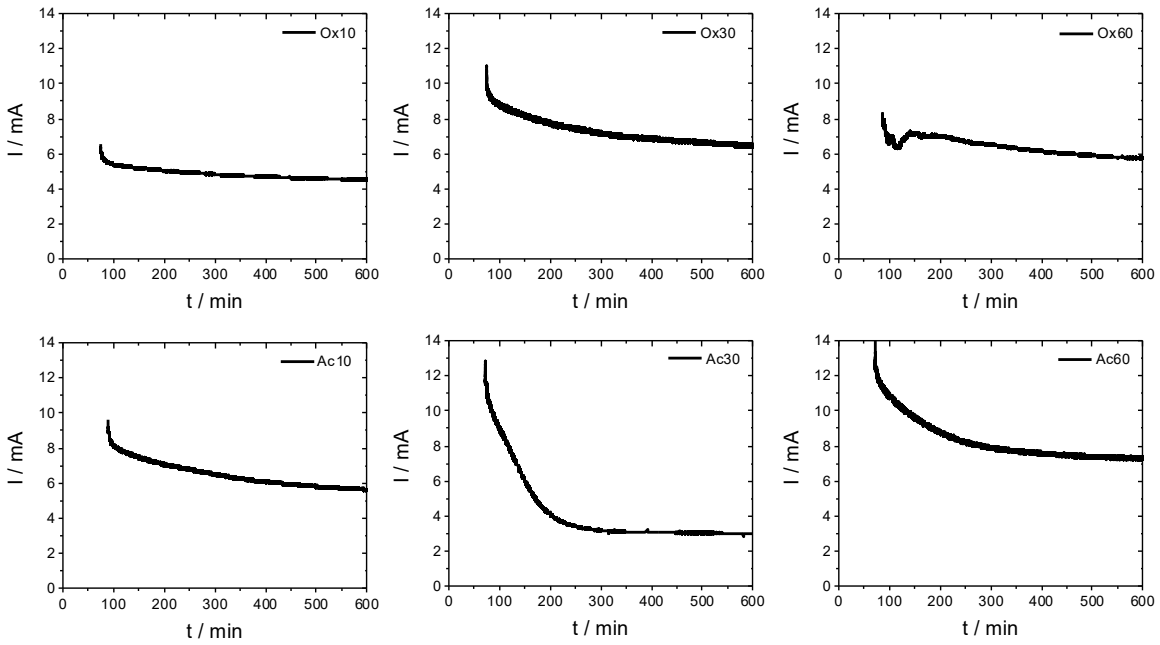

Figure S8. Stability measurements of Ox and Ac films in 0.05 M H_2SO_4 at 1.734 V_{RHE} (not IR corrected). The catalysts show a major loss of current in the beginning before running in to an almost stationary plateau, an approach to steady-state after quick potential change.