Record 1 of 1

Title: Discovery of High-Entropy Oxide Electrocatalysts: From Thin- FilmMaterial Libraries to Particles

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Source: CHEMISTRY OF MATERIALS **DOI:** 10.1021/acs.chemmater.2c01455 **Early Access Date:** NOV 2022 **Published Date:** 2022 NOV 17

Abstract: Discovery of new high-entropy electrocatalysts requires testing of hundreds to thousands of possible compositions, which can be addressed most efficiently by high-throughput experimentation on thin-film material libraries. Since the conditions for high-throughput measurements ("screening") differ from more standardized methods, it is frequently a concern whether the findings from screening can be transferred to the commonly used particulate catalysts. We demonstrate the successful transfer of results from thin-film material libraries to particles of Cantor alloy oxide (Co-Cr-Fe-Mn-Ni)3O4. The chemical compositions of the libraries, all singlephase spinels, cover a wide compositional range of (Cr8. 1-28.0Mn11 .6-28.4- Fe10.6-39.0Co11.4-36.7Ni13.5-31.4)37.7 +/- 0.6O62.3 +/- 0.6, with composition-dependent lattice constant values ranging from 0.826 to 0.851 nm. Electrochemical screening of the libraries for the oxygen evolution reaction (OER) identifies (Cr24.6 +/- 1 . 4- Mn15.7 +/- 2.0Fe16.9 +/- 1.8Co26.1 +/- 1.9Ni16.6 +/- 1.7)37.8 +/- 0.8O62.2 +/- 1.2 as the most active composition, exhibiting an overpotential of 0.36 Vat a current density of 1 mA cm-2. This "hit" in the library was subsequently synthesized in the form of particles with the same composition and crystal structure using an aerosol-based synthesis strategy. The similar OER activity of the most active thin-film composition and the derived catalyst particles validates the proposed approach of accelerated discovery of novel catalysts by screening of thin-film libraries.

Accession Number: WOS:000888028400001

PubMed ID: 36530940

Language: English

Document Type: Article; Early Access

KeyWords Plus: OXYGEN EVOLUTION; CATALYSTS; MICROSTRUCTURE

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Publisher: AMER CHEMICAL SOC
Publisher Address: 1155 16TH ST, NW, WASHINGTON, DC 20036 USA
Web of Science Index: Science Citation Index Expanded (SCI-EXPANDED)
Web of Science Categories: Chemistry, Physical; Materials Science, Multidisciplinary
Research Areas: Chemistry; Materials Science
IDS Number: 6L2OT
ISSN: 0897-4756
eISSN: 1520-5002
29-char Source Abbrev.: CHEM MATER
ISO Source Abbrev.: Chem. Mat.
Source Item Page Count: 13
Funding:

Funding Agency	Grant Number
European Research Council (ERC) under the European Union	
International Max-Planck Research School for Surface and Interface Engineering (IMPRS-SurMat) , Germany	
MERCUR project DIMENSION (Stiftung Mercator)	
Chinese Scholarship Council	
	833408

The authors acknowledge the contribution of Dr. Sabine Seisel (powder XRD measurements) , Dr. Michael Meischein (AFM measurements) , and Dr. Lars Banko (Python scripts) . The ZGH at the Ruhr University Bochum is acknowledged for XRD and SEM measurements. W.S and O.A.K. acknowledge funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation (grant agreement CasCat [833408]) . V.S. acknowledges a Ph.D. fellowship from the International Max-Planck Research School for Surface and Interface Engineering (IMPRS-SurMat) , Germany. V.S. and A.L. acknowledge additional support from the MERCUR project DIMENSION (Stiftung Mercator) . J.Z. acknowledges the Chinese Scholarship Council for a Ph.D. fellowship.

Open Access: Green Submitted
Output Date: 2026-01-06

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