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**Title:** Sputter-Deposited La-Co-Mn-O Nanocolumns as Stable Electrocatalyst for the Oxygen Evolution Reaction

**Author(s):** Piotrowiak, TH (Piotrowiak, Tobias H.); Krysiak, OA (Krysiak, Olga A.); Suhr, E (Suhr, Ellen); Zhang, J (Zhang, Jian); Zehl, R (Zehl, Rico); Kostka, A (Kostka, Aleksander); Schuhmann, W (Schuhmann, Wolfgang); Ludwig, A (Ludwig, Alfred)

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**Abstract:** A thin-film materials library (ML) of the La-Co-Mn-O system is fabricated by hot reactive combinatorial cosputter deposition and screened for its electrocatalytic activity for the oxygen evolution reaction. Within this ML, an area with superior catalytic activity is identified. In-depth characterization of this region reveals a unique columnar-grown microstructure showing a large catalytic surface and excellent stability during electrocatalytic measurements. A zoom-in into these structures shows that the columns are compositionally and structurally not homogeneous but are composed of a mixture of the perovskite phase LaCoMnO<sub>3</sub> and Co-Mn-O oxide. Nanoelectrochemistry using the particle on a nanoelectrode approach confirms the high activity as well as stability of the single columns.

A La-Co-Mn-O thin-film materials library, fabricated by combinatorial cosputter deposition, reveals an electrocatalytically high-performing region with a unique columnar-grown microstructure. These nanocolumns, consisting of a mixture of LaCoMnO<sub>3</sub> perovskite and Co-Mn-O oxide, demonstrate exceptional electrocatalytic activity and stability, which is confirmed by nanoelectrochemistry using the particle on a nanoelectrode technique. image (c) 2024 WILEY-VCH GmbH

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**Addresses:** [Piotrowiak, Tobias H.; Suhr, Ellen; Zehl, Rico; Ludwig, Alfred] Ruhr Univ Bochum, Inst Mat, Chair Mat Discovery & Interfaces, Univ Str 150, D-44780 Bochum, Germany.

[Krysiak, Olga A.; Zhang, Jian; Schuhmann, Wolfgang] Ruhr Univ Bochum, Fac Chem & Biochem, Analyt Chem, Ctr Electrochem Sci CES, Univ Str 150, D-44780 Bochum, Germany.

[Kostka, Aleksander] Ruhr Univ Bochum, Ctr Interface Dominated High Performance Mat ZGH, Univ Str 150, D-44780 Bochum, Germany.

**Corresponding Address:** Ludwig, A (corresponding author), Ruhr Univ Bochum, Inst Mat, Chair Mat Discovery & Interfaces, Univ Str 150, D-44780 Bochum, Germany.

Schuhmann, W (corresponding author), Ruhr Univ Bochum, Fac Chem & Biochem, Analyt Chem, Ctr Electrochem Sci CES, Univ Str 150, D-44780 Bochum, Germany.

**E-mail Addresses:** wolfgang.schuhmann@rub.de; alfred.ludwig@rub.de

**Affiliations:** Ruhr University Bochum; Ruhr University Bochum; Ruhr University Bochum

**Author Identifiers:**

Author	Web of Science ResearcherID	ORCID Number
Suhr, Ellen		0000-0003-3461-8274
Schuhmann, Wolfgang	S-2626-2016	0000-0003-2916-5223
Kostka, Aleksander	G-1111-2011	0000-0002-8306-4709
Piotrowiak, Tobias Horst		0000-0001-9378-1851
Kostka, Aleksander		0000-0002-8306-4709
Krysiak, Olga		0000-0002-7476-181X
Zhang, Jian		0000-0002-3900-2009
Ludwig, Alfred	G-1111-2011	0000-0003-2802-6774
Zehl, Rico		0000-0003-2390-5913

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