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

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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.

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