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Fabrice Mauvy, Jean-Claude Grenier, Julien Vulliet, Jean-Marc. Bassat, Aline Rougier. Électrode à oxygène de type  $\text{La}_2\text{NiO}_{4+\delta}$  pour électrolyseur de la vapeur d'eau à haute température (EHT). 2ème Réunion Plénières de la Fédération FRH2, Fédération FRH2, May 2022, Aussois, France. hal-04590136

**HAL Id: hal-04590136**

**<https://hal.science/hal-04590136v1>**

Submitted on 28 May 2024

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# Electrode à oxygène de type $\text{La}_2\text{NiO}_{4+\delta}$ pour électrolyseur de la vapeur d'eau à haute température (EHT)

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The present study focuses on an alternative structured oxygen electrode for solid oxide electrolysis cell (SOEC).  $\text{La}_2\text{NiO}_{4+\delta}$  nickelate, LNO, was selected with respect to its mixed electronic and ionic conductivity and its good chemical stability. Complete single cells were built using screen printing of LNO and  $\text{LaNi}_{0.6}\text{Fe}_{0.4}\text{O}_3$  (LNF) layers on a standard hydrogen electrode supported half cell consisting of a porous NiO-YSZ layer, a dense 8YSZ electrolyte layer and a thin interlayer of GDC. The polarization curves of LNO cells under various anodic flows of  $\text{H}_2\text{O}/\text{H}_2$  (90/10) show excellent performances compared to the commercial LSCF ( $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-x}$ ) based cells. The steam conversion ratio SC increases from around 40 % to 80 % when the gas flow decreases from 36 to 12 NmL/min/cm<sup>2</sup>. With a degradation rate of 1.5 %/1000 h after 500 h operating time ( $i = -0.5$  A/cm<sup>2</sup>), at 800 °C, using a medium gas flow of  $\text{H}_2\text{O}/\text{H}_2$  (90/10) of 24 NmL/min/cm<sup>2</sup>, LNO oxygen electrode shows higher durability than the state of the art LSCF oxygen electrode (4 %/1000 hrs). Energy efficiency analysis confirms the dependency of the total efficiency with the current density and gas flow allowing us to suggest optimized conditions for reaching targets of commercial  $\text{H}_2$  production.

[1] «  $\text{La}_2\text{NiO}_{4+\delta}$  as efficient oxygen electrode for Solid Oxide Electrolysis Cell », F.Mauvy, J-C Grenier, J.Vulliet, J-M Bassat, A. Rougier, Fuel Cell, 22 (2022) 48-56 <https://doi.org/10.1002/fuce.202200013>