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# Electrospinning as a tool for preparing rare earth-doped ceria nanofibers to be used in solid oxide cells

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Rare earth (RE)-doped ceria (RE ≡ Gd, Sm) is characterized by high values of ionic conductivity between 673 and 973 K, which make it a widely studied material to be used as an electrolyte in solid state cells working in the intermediate temperature range (IT-SOCs) [1]. Thanks to this property, it is also often mixed to the electrode material in order to enhance the ionic conductivity of the latter, and to make it a good mixed ionic-electronic conductor (MIEC). The relatively low operating temperature on one hand slows down the degradation process of the cell, but on the other hand it also lowers the cell performance, negatively affecting the electrode kinetics. For this reason, it is necessary to improve the electrode architecture, for instance by maximizing its surface area, in order to extend the three-phase boundary (TPB) in the interior of the electrode bulk.

Within this framework, electrospinning acts as a powerful tool for the production of 1D materials, such as nanofibers (Figure1) of composite electrodes, like the ones formed of a mixture of a perovskite-based electronic conductor (*e.g.* La, Sr, Cu, Fe oxides) and RE-doped ceria [2]; through this technique it is in fact possible to control morphology and size of the resulting fibers by tuning many instrumental processing parameters, such as voltage, flow rate, temperature, humidity, distance needle-collector, collector rotation and solution properties.

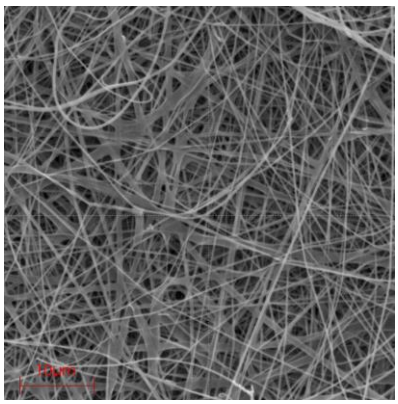

Figure1) image of GDC10 nanofibers, SEM SE, 5000x

In this work a preliminary study is presented, dealing with the preparation of $(Ce_{1-x}Gd_x)O_{2-x/2}$ and $Ce_{1-x}(GdSm)_xO_{2-x/2}$ ($x$ = 0.10, 0.15 and 0.20) nanofibers by electrospinning, and with their characterization by x-ray diffraction, electron microscopy and Raman spectroscopy. Results will be analyzed and discussed; relying on them, the most proper conditions will be chosen to attempt the perovskite/doped ceria co-electrospinning.

[1] *C. Artini, Inorg. Chem. 57 (2018) 13047-13062.*
[2] *C. Sanna et al., Int. J. Hydr. Energy 46 (2021) 13818-13831.*

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