Ink-jet printing of double protective coating for SOFC interconnect

Introduction
Finding new and more efficient ways to convert energy is one of the big challenges. Fuel cells, in particular Solid Oxide Fuel Cells (SOFC), are devices able to convert chemical energy directly into electricity, avoiding combustion and its associated pollution, with efficiencies exceeding 60%, i.e. better than the best thermal power plants. Development of a marketable product goes in part through materials research and optimization. For SOFC this means materials able to work at 700°C for at least 40 000 hours with low degradation (<0.5%/1000 hrs). Chromium-containing ferritic stainless steel plates are commonly chosen to separate gas flows between the ceramic cells in a series-connected stack. Chromium poisoning coming from steel components is one of the main sources of degradation inside a SOFC, therefore a protective coating is commonly applied on the metal to prevent migration of chromium. The state of the art for the coating deposition is physical vapor deposition or plasma spraying, but due to costs, time and materials use, new ways of deposition continue to be evaluated. Among others, ink-jet printing is attracting interest due to its flexibility and precision.

Aim of the project
The student involved in the project will develop a double coating ink for an ink-jet printer to be deposited one on each other on a metal support. Mechanical and electrical properties of this double layer will be tested.

Knowledge acquired
At the end of the project the student will have familiarity with the concept of SOFC, metal-ceramic coupling, rapid prototyping.

Note
The project will be held at EPFL Valais, in Sion. A contribution is provided for the transport expenses. Depending on the results, possibility of publishing is offered.

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