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► To cite this version:

Karl Vulliez, Annabelle Laplace-Ploquin, Géraldine Palcoux, Stéphane Di Iorio, Livia Ceruti, et al.. Study and improvement of sealing solutions for solid oxide cells. EFCF 2022: 15th European SOFC & SOE Forum, Jul 2022, Lucerne, Switzerland. cea-03773886

HAL Id: cea-03773886

<https://cea.hal.science/cea-03773886>

Submitted on 9 Sep 2022

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Study and improvement of sealing solutions for solid oxide cells

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Abstract

Solid oxide cells (SOC) stacks are by design mechanical complex structures. Ensuring the sealing of this ceramic/metallic multilayer assembly fed with different gases is technically very challenging. The efficient sealing of the stack inner structure and of the mechanical interface between the stack and its inlet/outlet interfaces is however mandatory to allow a proper operation of a SOC stack. The sealing being a critical technical issue for the development of industrial systems analyses of the stack vitrocement/glass cement were conducted in relevant conditions (high temperature, pressure, SOC standard gases) to qualify and understand their thermomechanical properties and technical limits.

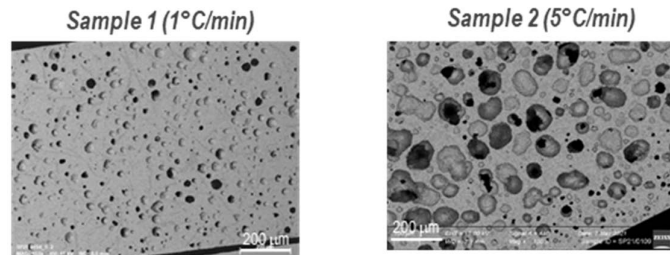


Figure 1 – Sealing material SEM images (backscattered electrons) – 2 temperature ramps

The first phase focused on the analysis of vitrocement seals structures linked to the initial condition and fabrication process. First results, obtained by image analysis show a strong impact of the thermal cycle on the sealing material porosity (Figure 1). These analyses were completed by mechanical tests and leak-rate measurements. This paper presents an overview of this work, the technical means and equipment gathered to address the stack sealing issues and the preliminaries outcomes.