

Study of a glass-ceramic seal: porosity and sealing

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Sealing is a major issue in high temperature electrolyzers used for hydrogen production. The specifications that seals must meet are particularly demanding. These numerous constraints lead to the use of glass powder suspended in organic solvents. The use of a composition that tends to crystallize allows, a priori, improving the thermal and mechanical properties.

Objectives of the study are to obtain a seal material with minimum porosity and define a standard sealing test. Ultimately, the objective is to make the link between the porosity and the sealing performances. Indeed, a large and interconnected porosity can create preferential leakage paths and decrease the sealing properties. Moreover, a dense material will, a priori, be mechanically more resistant than a porous one because a pore can initiate a crack that will eventually propagate through the seal.

The effect of the heat treatment on the seal's porosity is important and has to be clearly understood. For that, various heat treatments at different temperatures are realized on samples with a geometry close to the real one. Also, a standard seal measurement protocol has been developed to measure the sealing performances with relevant operating conditions.