

Torsional behaviour of a glass-ceramic joined alumina coated steel for solid oxide cells

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Robustness of sealings used for solid oxide cell (SOC) stack technology is crucial to avoid gas mixture and failure. With the aim of increasing the internal operating pressure, the requirement for the mechanical performance of sealings increases. Here the mechanical behaviour of a glass-ceramic joined steel (Crofer 22 APU) and glass-ceramics interfaces used in SOC stacks is studied. The shear strength was measured at room temperature using torsion test of as joined and aged (700 hours in air at 750 °C) hourglass shaped samples. The Crofer 22 APU steel samples have been coated by alumina before joining and the joining process has been designed according to shrinkage measurements from Hot Stage Microscopy. The glass-ceramic joining material has been applied as a tape casted foil between two alumina coated half hourglass steel samples, then joined at 800 °C, in air. Cross-sections and fracture surfaces have been investigated by SEM-EDS in order to understand the effect of ageing on the joined samples. XRD has been carried out on the as joined and on the aged glass-ceramic material to investigate the ageing effect on amorphous and crystalline phases. The shear strength of as joined and aged samples has been measured with torsion test.

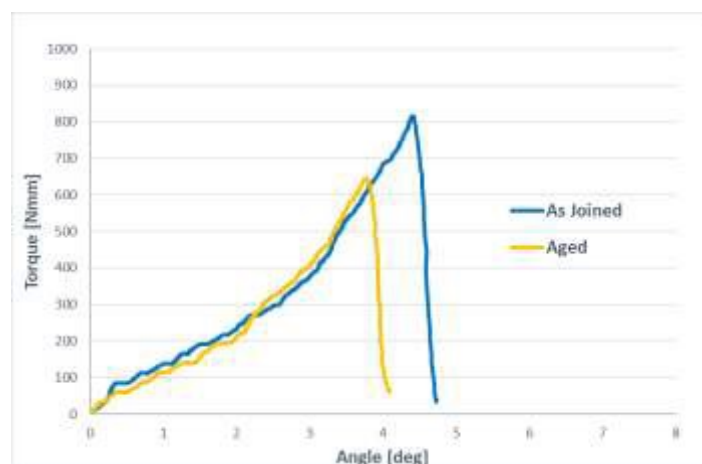


Figure 1. Two representative torsion tests results (Torque versus rotation angle) for as joined and aged samples of V11/alumina coating/Crofer22APU