



XXIX Brazil MRS Meeting

August 30th to
September 03rd IUMRS
ICEM 2021

VIRTUAL 

Electric field-assisted synthesis/sintering cerium oxide: 5 wt.% gadolinium oxide

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Gadolinium oxide ceramic powders were mixed to cerium oxide ceramic powders, pressed to pellets, and sintered either at 1450°C for 4 h or applying 200 V cm⁻¹ electric field at 800°C, 900°C and 1000°C. The structural phases and the microstructure of the sintered pellets were analyzed by X-ray diffraction and scanning electron microscopy, respectively. The formation of substitutional solid solution was followed by monitoring the increase of the electrical conductivity by impedance spectroscopy measurements and the X-ray diffraction patterns. The main results show that Joule heating due to the flow through the pellets of the electric current, which was produced by the application of the electric field, allows for promoting partial solid solution as well as partial sintering the ceria-gadolinia pellets. Moreover, grain growth that occurred in the high temperature sintered pellets was inhibited in the electric field-assisted synthesized/sintered pellets, being an alternative technique for producing cerium oxide-gadolinium oxide solid solutions.