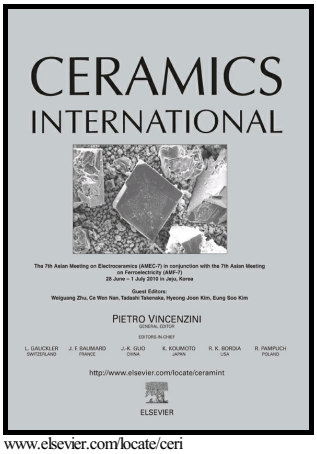

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Large-scale and ultra-low thermal conductivity of ZrO_2 fibrofelt / ZrO_2-SiO_2 aerogels composites for thermal insulation

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Abstract: The large-scale fibrous/aerogels composites are prepared by using zirconia fibrofelt (ZFF) as skeleton to give high strength and ZrO_2-SiO_2 aerogels (ZSA) as filler to give excellent thermal insulation through vacuum impregnation. The ZFF/ZSA with a low density of 0.302g/cm^3 and a high porosity (89%) exhibits large size of 180 mm in length, 180 mm in width and 25 mm in height which is larger than other fibrous aerogels. Meanwhile, the ZFF/ZSA exhibits high compressive strength of up to 0.17 MPa which is approximately six times higher than that of ZFF (0.028MPa). The ZFF/ZSA shows a much lower thermal conductivity of 0.0341 $W\cdot m^{-1}\cdot K^{-1}$ at room temperature and 0.0460 to $0.096\cdot m^{-1}\cdot K^{-1}$ during 500℃ and 1100℃ which are lower than that of conventional fibrous materials, indicating its excellent thermal insulation property in a wide temperature range, and the thermal insulation mechanism is analyzed. Thus, the large-scale, low density, high strength,

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