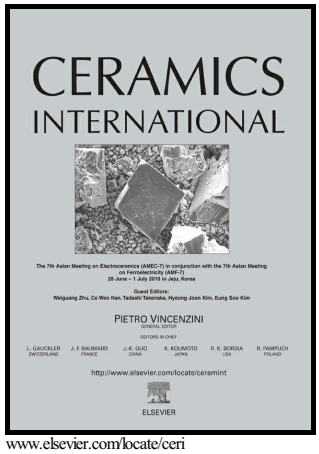

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Improved resistance of lanthanum zirconate coatings to calcium-magnesium-alumina-silicate corrosion through composition tailoring

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Abstract

Calcium–magnesium–alumina–silicate (CMAS) corrosion resistance is an important issue on the design of next-generation thermal battier coatings. As one of the promising thermal battier coatings, the lanthanum zirconate coating has attracted continuous attention. In this work, three lanthanum zirconate coatings with different La/Zr composition, i.e., $La_{1.8}Zr_{2.2}O_{7.1}$, $La_2Zr_2O_7$, and $La_{2.5}Zr_{1.5}O_{6.75}$, are fabricated by laser-enhanced chemical vapour deposition, and their resistance to CMAS corrosion at 1250 °C is investigated. Among them, $La_{2.5}Zr_{1.5}O_{6.75}$ shows the best CMAS corrosion resistance because increased La content is beneficial to the formation of a dense and continuous apatite $Ca_2La_8(SiO_4)_6O_2$ layer, which effectively slows down the subsequent molten CMAS penetration. This study clarifies the significant role of rare earth on CMAS corrosion resistance and is expected to guide the future design of rare-earth-based thermal battier coatings through composition tailoring.

Keywords: Lanthanum zirconate, Thermal barrier coating, Laser-enhanced chemical vapour