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Thermal Barrier Coatings by Electron Beam-Physical Vapor Deposition of Zirconia Co-Doped with Yttria and Niobia

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The most usual ceramic material for coating turbine blades is yttria doped zirconia. Addition of niobia, as a co-dopant in the $Y_2O_3-ZrO_2$ system, can reduce the thermal conductivity and improve mechanical properties of the coating. The purpose of this work is to evaluate the influence of the addition of niobia on the microstructure and thermal properties of the ceramic coatings. SEM on coatings fractured cross-section shows a columnar structure and the results of XRD show only zirconia tetragonal phase in the ceramic coating for the chemical composition range studied. As the difference $NbO_{2.5}-YO_{1.5}$ mol percent increases, the tetragonality increases. A significant reduction of the thermal conductivity, measured by laser flash technique, in the zirconia coating codoped with yttria and niobia when compared with zirconia-yttria coating was observed.