Influence of Manganese on the Sintering Properties of Tetragonal Zirconia


Abstract:

The influence of small additions of MnO2 (up to 1 wt. %) on the sintering behaviour of yttria-stabilized zirconia sintered over the temperature range from 1250°C to 1500°C was investigated. It was found that the mechanical properties of Y-TZP were dependent on the dopant amount and sintering temperature. The results revealed that relative densities above 97.5 % of theoretical (i.e. > 5.95 Mg m-3) could be obtained in Y-TZPs sintered at low temperatures, 1250°C and 1300°C, with the additions of ≥ 0.3 wt. % MnO2. In comparison to the undoped samples, the additions of up to 1 wt. % MnO2 and for sintering up to 1350°C was found to be beneficial in enhancing the Vickers hardness of the ceramic. The fracture toughness of Y-TZP however, was found to increase only in the 1 wt. % MnO2-doped samples when sintered above 1400°C. The relation between the measured mechanical properties is discussed with the emphasis on the role of the manganese oxide.

Keywords:

Y-TZP, Zirconia, Manganese Oxide, Mechanical Properties

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