Evaluation of microstructural homogeneity of HK-30 stainless steel formed by gelcasting

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Abstract:
The gelcasting process is a consolidation technique that consists in filling a mold with a highly loaded aqueous suspension followed by gelation due to the polymerization of water-soluble monomers. Although this process has been widely used for shaping ceramic parts using colloidal suspensions, its application in powder metallurgy is rather incipient, due to rapid settling of larger and denser metallic particles. In this work, HK-30 stainless steel powders with different grades (10F and 20F) were gelcast into cylindrical molds (90 mm high), with the help of a suspending agent. Gelled bodies were dried, vacuum sintered and sliced across the settling direction in order to assess the effect of the suspending agent on particles settling. Both the sintered density and the microstructure were homogeneous along the cylinder axis, showing that any effect associated to particles settling could be avoided. Final density was close to the theoretical value, although the samples produced with 10F grade powder presented a small residual porosity. The microstructures were similar to those reported for this powder processed by MIM.