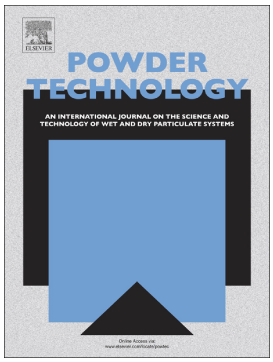

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Improving titanium injection moulding feedstock based on PEG/PPC based binder system

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Abstract

Binder system is an integral part of metal injection moulding (MIM) process that holds the metal powder together until the first stage of sintering. In this research, a new binder system was developed consisting of water soluble polyethylene glycol (PEG) as the main component, while poly (propylene carbonate) (PPC) and poly (methyl methacrylate) (PMMA) were used as the backbone components for titanium-MIM processing. The macromolecular interactions between various binder components were evident from Fourier-transform infrared (FTIR) spectroscopy and scanning electron microscopy (SEM) studies. The interactions between polymeric components in the binder provided ample compatibility within the binder system as revealed from the thermo-rheological properties of the titanium-MIM feedstock, which ensured suitability for thermal processing. Incorporation of PMMA in PEG/PPC binder system significantly improved the green strength of the moulded parts especially after initial water debinding step and thereby facilitated the following thermal processing. In addition, the chemical interactions between the polymers in PMMA-containing binder system enhanced the thermal stability of the as-moulded parts. Hence, the interactions between different polymeric materials showed a crucial role in developing suitable binder system for the MIM processing. The oxygen, carbon