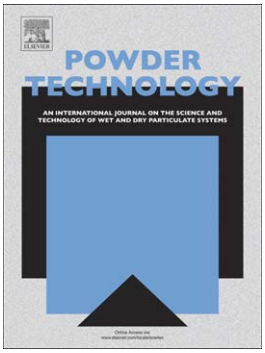

Aqueous debinding of polyvinyl butyral based binder system for titanium metal injection moulding

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Abstract

Titanium is biocompatible, has high specific strength and high corrosion resistance compared to other materials. Producing near-net shape parts by metal injection moulding (MIM) minimizes the need for secondary operations required for other metal-working processes such as casting, forging, and investment casting. Removing binder (debinding) from the MIM moulded part without disturbing the powder particles is a crucial stage. Titanium-MIM parts were manufactured from hydride-dehydride (HDH) titanium alloy powder Ti-6Al-4V (d_{10}, d_{50} and d_{90} of 12.8, 51.8 and 117.7 µm respectively) and various polyethylene glycol-polyvinyl butyral (PEG-PVB) based binder systems. The effect of binder composition, powder loading (55 and 60 vol. %), debinding time and temperature on the debinding rate for removing PEG with water, and porosity and microstructure of moulded parts was investigated. Solvent debinding had dissolution-controlled and diffusion-controlled stages; increasing debinding temperature shortened the dissolution-controlled stage. The amount of PEG removed increased with initial