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Development of a Composite Porous/Dense Titanium Dental Implant using a MIM Preform

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Dental implants are posts that are placed into the jawbone to take the place of missing tooth roots. They provide means of replacing lost teeth and restoring natural dental function. New implant designs with porous coating have been proposed to enhance osteointegration and the bone-implant interface. This paper presents the development of a composite porous/dense dental implant based on two powder metallurgy approaches: MIM of titanium for the dense core and titanium foam coating for the outer surface. The focus of the paper is toward the production of the dense core using MIM technology. The mold design was done with the aid of full 3D injection molding simulation. A MIM feedstock was made of plasma atomized CpTi-Grade 1 powder and a wax based binder. The effect of debinding and sintering conditions were studied and optimized in order to minimize the oxygen and carbon content and to eliminate part distortion. The effect of the post-processing (titanium foam coating application) on the dimensional stability and final oxygen and carbon contents is presented.