

Abstract: Due to the advantages over other metallic materials, such as superior corrosion resistance, excellent biocompatibility, and favorable mechanical properties, titanium, its alloys and related composites, are frequently utilized in biomedical applications, particularly in orthopedics and dentistry. This work focuses on developing novel titanium-titanium diboride (TiB₂; ceramic material) composites for dental implants where TiB₂ additions were estimated to be 9 wt.%. In a steel mold, Ti-TiB₂ composites were fabricated using a powder metallurgy technique and sintered for five hours at 1200 C. Microstructural and chemical properties were analyzed by energy dispersive X-ray spectroscopy (EDX), scanning electron microscopy (SEM), and X-ray diffraction (XRD) to evaluate the impact of the TiB₂ ceramic addition. Compressive strength, Brinell hardness, porosity, and density, among other mechanical and physical properties, were also measured and characterized. It has been found that adding TiB₂ to Ti increases its porosity (35.53%), compressive strength (203.04 MPa), and surface hardness (296.3 kg/mm²) but decreases its density (3.79 gm/cm³). The lightweight and strong composite could be suitable for dental implant applications.