

عنوان مقاله:

Study the properties of calcium phosphate coating applied on the composite implant of SPSed Ti-10 Mo-X (TiC & TiB₂) at 1450 °C

محل انتشار:

دومین کنفرانس بین المللی کاربرد مواد و ساخت پیشرفته در صنایع (سال: 1401)

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خلاصه مقاله:

In the present study, Ti-10Mo-X (TiC & TiB₂) composites produced by spark plasma sintering (SPS) at 1450 °C containing different amounts of ceramic reinforcements ($0.5 \leq X \leq 4$) were chosen as the implant material. The key step to obtain an appropriate connection at the bone-implant interface which involves optimal cellular interaction, is the surface modification of the metallic implant using the calcium phosphate (CaP) bioceramics. The CaP coating was applied on this composite by electrodeposition method at constant DC current densities of 0.5 and 0.7 mA.cm⁻² for 30 minutes. Scanning electron microscopy (SEM), X-ray energy distribution spectroscopy (EDS), and Fourier transform infrared (FTIR) spectroscopy were used to study the morphology, chemical composition, phase structure, and bond identification within the coating, respectively. The static drop wetting test was also used so as to evaluate the surface wettability of the coated samples. Microscopic investigations showed that the coating applied at a current density of 0.7 mA.cm⁻² has better coherence and uniformity in the crystal distribution. According to the results of the EDS analysis, the amount of the Ca/P molar ratio in the coating applied at 0.7 mA.cm⁻² is approximately equal to that of the bone, so this current density was chosen for further studies. The results of FTIR analysis revealed that the obtained coatings were mainly containing the carbonated hydroxyapatite (CHA) phase. Furthermore, the results of the wetting test showed that by applying the CaP coating the wetting angle decreased, indicating improving the hydrophilicity of the implant's surface. To determine the bioactivity, the apatite forming ability test of the coated sample were carried out in SBF solution and an apatite layer with spherical morphology appeared on its surface after 5 days immersion period.

کلمات کلیدی:

.Composite Ti-10Mo, TiC & TiB₂ reinforcement, Spark Plasma Sintering, CaP Coating, Electrodeposition, Bioactivity

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