عنوان مقاله:

Comparison the bio compatibility and mechanical properties of UHMWPE-based composites containing MWCNTs and vitamin E in artificial joint applications

محل انتشار:

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خلاصه مقاله:

Today one of the most common diseases among elderlies and even youth is joint diseases. One approach for addressing this issue is artificial joint replacement. Majority of artificial joints incorporate biomedical grade of Ultra High Molecular Weight Polyethylene (UHMWPE), which has a promising mechanical property. The aim of this project was to improve the mechanical properties and biocompatibility by adding ۰.۵ wt% multi-wall carbon nanotubes (MWCNTs) and ۰.۲۵ wt% alpha tocopherol (vitamin E) to UHMWPE matrix, and this mixture processed by ball milling (BM) and direct compression molding (DCM); besides, the Effect of each additive on mechanical and biocompatibility of UHMWPE matrix separately analyzed. FTIR was carried out to determine polymer's structure that showed a minor increase in oxidation resistance of "C+V" sample in comparison with the pure UHMWPE. Wettability test was conducted by contact angle method to measure the hydrophobicity of samples and the results showed a significant increase in hydrophobicity by adding MWCNT and vitamin E simultaneously. DSC results conducted to calculate the crystallinity of samples and the results showed ۲% increase in the crystallinity of "C+V" sample. XRD test was carried out to evaluate the crystallinity and phases of samples, which the results confirmed the DSC data. In order to investigate the young's modulus, DMTA test was performed which, results showed "C+V" and "C" samples had a great tensility. MTT assay was carried out to investigate cultured cellular metabolic activity and biocompatibility that "C" showed cytotoxicity, on the other hand, other samples had a great biocompatibility.

کلمات کلیدی:

UHMWPE, MWCNT, Vitamin E, nanocomposite, joint replacement.