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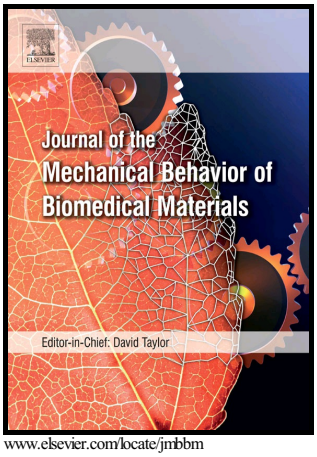

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In-vitro biocompatibility, bioactivity, and mechanical strength of PMMA-PCL polymer containing fluorapatite and graphene oxide bone cements

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Abstract

In this study, a bone cement consisting of poly methyl methacrylate (PMMA)–poly caprolactone (PCL)–fluorapatite (FA)–graphene oxide (GO) was synthesized as bone filler for application in orthopedic surgeries. The FA and GO particulates were homogenously distributed in the PMMA-PCL polymer matrix and no defects and agglomeration were found in the PMMA-PCL/FA/GO bone cement. The in-vitro bioactivity result exhibited that addition of FA and GO to the polymer cement (PMMA-PCL) improved the apatite formation ability on the surface of polymer. The results also showed that addition of FA to the polymer bone cement escalated the compressive strength and elastic modulus while reducing elongation to 8±2%. However, after addition of GO into the PMMA-PCL/FA bone cement, both compressive strength and elongation considerably increased to 101±5 MPa and 35±6%, respectively. Furthermore, tensile tests exhibited that inclusion of GO was favorable in improving the tensile modulus, UTS and elongation of the PMMA-PCL/FA bone cement. The cytotoxicity test pointed out that MG63 osteoblast cells viability increased to 279±15% after addition of FA and GO to the PMMA-PCL polymer bone