
ABSTRACT: Poly(etheretherketone) (PEEK) is a rigid semi-crystalline polymer with outstanding mechanical properties, bone-like stiffness and suitable biocompatibility that has attracted much interest as a biomaterial for orthopedic and dental implants. However, the bio-inert surface of PEEK limits its biomedical applications when direct osteointegration between the implants and the host tissue is desired. In this work, -PO4H2, -COOH and -OH groups were introduced on the PEEK surface by further chemical treatments of the vinyl-terminated silanization layers formed on the hydroxyl-pretreated PEEK surface. Both the surface-functionalized and pristine specimens were characterized by X-ray photoelectron spectroscopy (XPS), attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy and water contact angle measurements. When placed in 1.5 strength simulated body fluid (SBF) solution, apatite was observed to form uniformly on the functionalized PEEK surface and firmly attach to the substrate. The characterized results demonstrated that the coating was constituted by poorly crystallized bone-like apatite and the effect of surface functional groups on coating formation was also discussed in detail. In addition, in vitro biocompatibility of PEEK, in terms of pre-osteoblast cell (MC3T3-E1) attachment, spreading and proliferation, was remarkably enhanced by the bone-like apatite coating. Thus, this study provides a method to enhance the bioactivity of PEEK and expand its applications in orthopedic and dental implants.

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