

Thermal and mechanical properties of ultrahigh molecular weight polyethylene/high-density polyethylene/polyethylene glycol blends.

ABSTRACT

Blends of ultrahigh molecular weight polyethylene (UHMWPE) with high-density polyethylene (HDPE) provide adequate mechanical properties for biomedical application. In this study, the mechanical and thermal properties of UHMWPE/HDPE blends with the addition of polyethylene glycol (PEG) prepared via single-screw extruder nanomixer were investigated. The UHMWPE/HDPE blends exhibit a gradual increase in strength, modulus, and impact strength over pure polymers, suggesting synergism in the polymer blends. The elastic and flexural modulus was increased at the expense of tensile, flexural, and impact strength for the blends containing PEG. The degradation temperature of UHMWPE was improved with the incorporation of HDPE due to good thermal stability of HDPE. HDPE improved the dispersibility of PEG in matrix, consequently reduced the surface area available for the kinetic effects, and reduced the degradation temperature. The morphology analysis confirmed the miscibility between UHMWPE and HDPE and the changes in polymer structure with the presence of PEG modify the thermal behavior of the blends. The mechanical properties of the blends that are underlying values for the design of implant material show the potential used as biomedical devices.

Keyword: High-density polyethylene; Mechanical properties; Polyethylene glycol; Thermal properties; Ultrahigh molecular weight polyethylene.