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Abstract

Hydrogels derive their name from their super absorbent natural. Hydrogels have inherently weak mechanical strength. However, the advantages of bio-compatibility and hydrophilicity make hydrogels become biomaterials for many medical applications. UV polymerized PAA-Alg-Si (Poly Acrylic Acid-Alginate-Silica) hydrogels have the potential to be used to repair the damaged articular cartilage due to the properties of low friction and high mechanical strength. The weight ratios of PAA and Silica in PAA-Alg-Si hydrogels have effect on the mechanical properties of PAA-Alg-Si hydrogels. In this study, the fracture resistances and the viscoelastic properties of UV polymerized PAA-Alg-Si hydrogels were investigated. The fracture resistances of aforementioned hydrogels with different Acrylic acid (AAc) and Silica (Si) weight ratios were investigated under tensile load. Single notched tensile tests were used to examine the fracture properties of these hydrogel materials under tensile load. Fracture resistances of nine different types of UV polymerized PAA-based hydrogels were characterized. Fracture resistance was computed by dividing fracture work by the new created fracture area under single notched tensile test. In current study, hydrogels were considered as linear viscoelastic materials. The fracture works were computed by subtracting the estimated work due to viscoelastic dissipation from the work between loading and unloading load-extension curves of single notched tensile tests. Furthermore, the time dependent mechanical properties of UV polymerized PAA-Alg-Si hydrogels under uniaxial tensile loads were characterized. The experimental data were obtained at three different loading displacement rates (0.08, 0.2 and 0.6 mm/sec) and these data were fitted into the standard linear solid models.
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