Surface Characterization and Blood Compatibility of Poly(ethylene terephthalate) Modified by Plasma Surface Grafting

J. Wang 1,2, C. J. Pan 1, N. Huang 1, H. Sun 1, P. Yang 1, Y. X. Leng 1,
J. Y. Chen 1, G. J. Wan 1, and P. K. Chu 2*

1 Institute of Surface Engineering of Biomaterials, School of Materials Science and Engineering, Southwest Jiaotong University, Chengdu 610031, China
2 Department of Physics and Materials Science, City University of Hong Kong, Tai Chee Avenue, Kowloon, Hong Kong

Poly(ethylene terephthalate) (PET) films were treated by argon plasma discharge and grafted by different molecular water-soluble polyethylene glycols (PEG). The surface properties of the plasma treated and grafted films were determined by contact angle measurement, XPS, and ATR-FTIR. The contact angle of water decreased from 83.5° to 38.7° and the interfacial energy diminished from 30.7 mN/m to 6.3 mN/m. The ratio of oxygen to carbon increased from 0.15 to 0.25. All the results revealed that PEG chains were successfully grafted onto the surface of the PET films. The interaction between the surface-modified PETs and blood components was investigated to evaluate the blood compatibility of the samples. Activated partial thromboplastin time (APTT) of the PET-PEG was significantly longer than that of the untreated PET. SEM and optical microscopy indicated that adhered, aggregated and morphologically changed platelets were significantly reduced by grafting PEG chains onto the PET films. The in vitro blood compatibility tests suggested that the blood compatibility of PET grafted with PEG was related to the molecular weight of PEG. The best blood compatibility was achieved when the grafted molecular weight of PEG was 6000. The hemocompatibility improvement can be explained by the low interfacial free energy, sterically hindered effects of PEG chains, and maintaining of the normal conformation.