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Competitive Protein Adsorption and Platelet Adhesion on Poly(Ethylene Terephthalate) Surface Modified by Plasma Glazing

J. Wang 1, 2, C. J. Pang 3, N. Huang 3, S. Hong 3, P. Yang 3, Y. X. Leng 3, J. Y. Chen 3, G. J. Wang 4, P. K. Chu 3

1Dept. of Physics and Materials Science, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong 2Surface Engineering of Biomaterials, School of Materials Engineering, Southeastern University, Changsha 410004, China

We report a study involving different molecular weight polyethylene glycol (PEG) chains grafted on poly(ethylene terephthalate) (PET, Dacron) films by plasma surface grafting modification. These surface-modified PETs were characterized by means of contact angle measurements, X-ray photoelectron spectroscopy (XPS) and attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR). The contact angle of water decreased from the original 43.5° to 38.7°. The result showed that the chains of PEG were successfully grafted on the surface of PET and the water wettability of PET surface was improved. The competitive adsorption relation of plasma protein (fibrinogen and albumin) on material surface was analyzed with respect to surface energy and interface free energy. The results reveal that PET films grafted with PEG long chains possess the characteristic of preferential adsorbing albumin and this adsorption tendency on the grafted PEG6000 sample is most distinct. The platelet adhesion test on PET films whose surfaces have been pre-exposed with fibrinogen and albumin indicates that the surface of adsorbed albumin effectively inhibits platelet adhesion and aggregation, and possesses favorable blood compatibility, but on the other hand, the adsorbed fibrinogen surface enhances platelet adhesion and aggregation.

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Electrical Stability of the n-CaF Film with Low-k Dielectric Constant Deposited by ICPCVD Method

H.J. Ko and C.K. Choi

Department of Physics, Chon National University, Chon 660-783, Korea

Electrical stability of the film for ultra-large scale integrated circuit (ULSI) multilevel interconnections is studied. The n-CaF films with a low dielectric constant were deposited on a p-type Si(100) substrate using a methane/CH4 and an tetrafluoride/C4F4 gases by an inductively coupled plasma chemical vapor deposition (ICPCVD). Fourier transform infrared showed that the film has C-0, C-F, C=O, and C=O related bonds. Also, the dielectric constant might be decreased greatly due to the reduction of C-O bond in the film. It was found that the C=O bonding configuration changed from C-O bond to C=O and C=O bond as function of CH4/CH3 flow rate ratio. There, the reduction of the dielectric constant can be obtained by varying C=O bonding configuration as well as incorporation fluorine atoms in the film. The relative dielectric constant, leakage current density, and dielectric breakdown field strength of MS (Al/n-CaF film/p-Si) structure are investigated.

1 csko@chojuni.ac.kr

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1 paul.chu@cityu.edu.hk

408