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论文

不同表面性质聚电解质多层膜的制备及蛋白质吸附和血液相容性能

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摘要:

利用层层自组装方法制备了聚烯丙基铵盐酸盐(PAH)/聚苯乙烯磺酸钠(PSS)多层膜. 通过吸附或共价偶联, 在多层膜表面修饰了聚乙二醇(PEG)、牛血清白蛋白(BSA)或肝素, 通过石英晶体微天平(QCM)、椭圆偏振光谱和原子力显微镜(AFM)研究了多层膜的表面形貌及修饰方法对各种蛋白的吸附性能. 经修饰后的多层膜较基底膜的厚度均有所增大; 最外层经修饰后的多层膜吸附的BSA、纤维蛋白原及血浆蛋白的量较未修饰多层膜均有所减少. 采用SEM观察了血小板在多层膜上的黏附情况和形态变化, 计算了血小板的黏附率. 比较各多层膜的凝血酶原时间(PT), 发现修饰后的多层膜的凝血酶原时间均有所延长, 但各组间无显著性差异.

关键词: 聚电解质多层膜; 肝素; 白蛋白; 聚乙二醇; 血液相容性

Preparation, Protein Adsorption and Blood Compatibility of Polyelectrolyte Multilayers with Different Surface Properties

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Abstract:

Poly(styrene sulfonate)/poly(allylamine hydrochloride) multilayers were assembled on silicone wafers *via* the technique of layer-by-layer assembly. Their surfaces were further modified either physically or chemically with bovine serum albumin(BSA), heparin and polyethylene glycol(PEG). Protein adsorption on these surfaces was investigated by quartz crystal microbalance(QCM), ellipsometry and atomic force microscopy(AFM). The dynamic adsorption process of BSA on these multilayers was monitored by QCM, revealing that the adsorption equilibrium was rapidly achieved within 3 min on the control and heparin adsorbed multilayer surfaces, and within 5—10 min on the chemically bonded BSA and PEG surfaces, but more than 80 min on the BSA physically modified surface. After adsorption of BSA or fibrinogen, all the modified multila-yers became smoother due to the effect of “surface valley adsorption”. Ellipsometry characterization found that the adsorbed mount of BSA, fibrinogen and plasma proteins on all the modified multilayers were smaller than that of the unmodified control multilayers. The platelet adsorption on the multilayers was analyzed by SEM, revealing that the number of the adsorbed platelets on all the modified surfaces except of the heparin modified one was significantly reduced. The prothrombin time(PT) of all the modified multilayers was prolonged compared with that of the unmodified multilayers, but there was no significant difference between all the samples.

Keywords: Polyelectrolyte multilayer; Heparin; Albumin; Polyethylene glycol; Blood compatibility

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