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A strong adhesive block polymer coating for antifouling of large molecular weight protein

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ABSTRACT

Some proteins secreted by microorganisms have large molecular weights. We report here an approach to prepare coating by multilayer polymers for antifouling of proteins, especially the proteins with a large molecular weight. Stainless steel was used as the model substrate. The substrate was first coated with a hybrid polymer film, which was formed by simultaneous hydrolytic polycondensation of 3-aminopropyltriethoxysilane and polymerization of dopamine (HPAPD). After grafting the macroinitiator 2-bromoisobutyryl bromide, the block polymer brushes PMMA-b-PHEMA were grafted. Three proteins were used to test protein adsorption and antifouling behavior of the coating, including recombinant green fluorescent (54 kDa), Recombinant R-transminase (2 x 90 kDa), and recombinant catalase (4 x 98 kDa). It is demonstrated that the block polymer brushes not only can prevent the adsorption of small molecular weight proteins, but also can significantly reduce the adsorption of the large molecular weight proteins.

Keywords: Antifouling; protein; block polymer; surface; polymerization

1. Introduction

Biofouling is ascribed to the adsorption and accumulation of proteins and micro- and macroorganisms on surfaces [1]. Biofouling causes problems in medical implants, surgical devices, biosensors, food processing and packing, and marine ships [2-6]. Biofouling starts with adsorbed proteins to create a conditioning film on the substrates, followed by colonization by adherent bacteria. The colonized bacteria result in the bacterial colonization is irreversible adhesion, and it is almost impossible to reduce biofouling once formed on a solid surface [8]. Thus, it is necessary to develop

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