Adsorption of serum proteins on LbL films based on chitosan graft copolymers with polyvinyl alcohol and dextran sulfate

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Layer-by-layer (LbL) films of polyelectrolytes modified with side chains of hydrophilic polymer is a promising way to improve surface biocompatibility and resistivity to protein adsorption of films and nanoparticles. The coating obtained by electrostatic adsorption of chitosan (CH) grafted with poly(ethylene glycol) (PEG) or dextran of low molecular weight and dextran sulfate (DS) has been shown to decrease adsorption of fetal bovine serum (FBS) proteins [1].

Poly(vinyl alcohol) (PVA, 2.0 kDa) was synthesized by radical polymerization of vinyl acetate in the presence of chain transfer agent followed by acid-catalyzed hydrolysis [2]. Copolymers of CH (450 kDa) with PVA (CH-PVA) were obtained using EDC as a crosslinker [1]. The degree of substitution (χ) was controlled by varying the PVA/CH mass ratio in the reaction mixture. The wet mass of $(CH\text{-}PVA/DS)_n$ films was evaluated using a quartz crystal microbalance. The dry mass was recalculated from absorbance at 497 nm of the LbL film of FITC-labeled copolymers [1]. The $L/2R_g$ parameter was calculated using experimental surface distance between PVA chains and the radius of gyration of PVA (1.1 nm).

The thickness of a CH-PVA/DS bilayer is 1.1±0.2 nm and almost independent of χ. The mass of FBS protein adsorbed on the $(CH\text{-}PVA/DS)_{5.5}$, χ=0.33 films decrease by 50% as compared with unmodified CH. The protein resistance of the LbL films is reciprocal to $L/2R_g$. The protein resistance efficacy of LbL films based on CH-PVA graft copolymers is comparable with that of PEG-based ones.

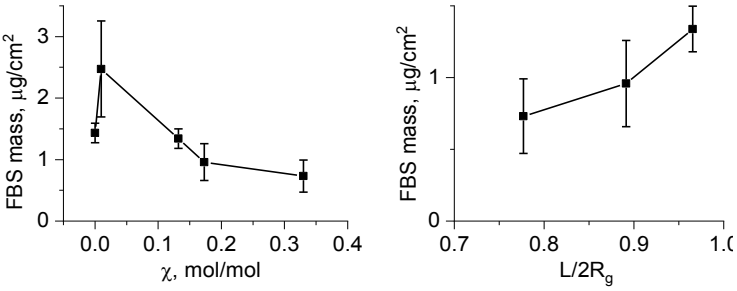

Fig. Protein resistance of $(CH\text{-}PVA/DS)_{5.5}$ films

References

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