Polypeptide Chirality Influences Multilayer Thin Film Growth and Structure

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Polypeptide multilayer thin films are being developed for a variety of applications. These include coatings for implant devices and systems for drug delivery in the biomedical sciences, and optical coatings. Subsequent polymer adsorption steps involve polymers of opposite polarity. Here, the polymers were polypeptides. This project compared the consequences of changing polypeptide chirality on film growth and structure. The peptides were poly(L-glutamic acid), its right-handed counterpart, poly(D-glutamic acid), and poly(lysine-tyrosine). The first two are negatively charged at neutral pH, the third one is positively charged. Poly(lysine-tyrosine)/poly(L-glutamic acid) films and poly(lysine-tyrosine)/poly(D-glutamic acid) films were fabricated on 1 mm-thick quartz plates. In one experiment, films were grown to 34 layers. The UV absorption spectrum was taken after each layer deposited to determine the rate of polymer self-assembly. Separately, UV or visible wavelength spectra were obtained for films stained with a dye cooled/heated in the range 4-65 °C. In another experiment, a mixture of poly-L-glutamic acid and poly-D-glutamic acid was used as the polyanion for film buildup. The data show that poly(lysine-tyrosine)/poly(L-glutamic acid) films built up at a higher rate than the corresponding right-handed films.