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Confinement Effect on Structure and Elasticity of Proteins Interfacing Polymers[1] HAOYU WANG, PINAR AKCORA, Stevens Institute of Technology — E-beam patterned nanoporous PMMA thin films are used as templates for protein functionalization to study the confinement effect on structural and mechanical properties of the globular lysozyme and the rod-shaped fibrinogen. We characterize the structure and elasticity of these proteins tethered inside the pores, and discuss the relations between the concentration of attached proteins, protein orientation and conformation in different pore sizes. Adhesion force mapping measured in atomic force microscopy reveals that the end-on attached fibrinogens induce higher concentration than the side-on attached proteins. Fourier-transform infrared spectroscopic analysis of protein secondary structures and nanoindentation results show that fibrinogen undergoes less structural changes and behaves less stiff when pore size is close to the protein size, which is due to less protein-surface interactions and higher concentration of end-on attached fibrinogen in 50nm pores than other pore sizes. Lysozyme, on the other hand, retains its native-like structure and exhibits the highest modulus in 15nm pores due to the lower macromolecular crowding effect the protein faces compared to lysozyme within larger pores.

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