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Synergetic binding and lateral segregation in polymer decorated micelles and nanoparticles IGAL SZLEIFER, RIKKERT NAP, Northwestern University — Nanocarriers show great potential as drug delivery devices or as imaging agents. Experimental relevant examples of nanocarriers involve micelles made of low molecular weight polyethylene glycol and phospholipids. An important feature of these 'nano' micelles is that the polymers are mobile. A fundamental question is how different polymeric coatings result in optimal nanoparticle-surface interactions. We used a molecular theory to investigate the effect of the conformational entropy, specific interactions and lateral mobility on the structure of the polymer coatings and the binding of the nanocarrier to a cell surface. In micelles that contain chains of different molecular weights, the long and short polymer chains segregate upon approaching the surface, as a result of competing entropic forces. Nanocarriers made of mixtures of weak polyelectrolytes with ligands at their free ends and neutral polymers can bind to charged surfaces or through specific ligand-receptor interactions. We show that under appropriate conditions there is a dramatic synergetic effect between electrostatic and ligand-receptor binding. The synergetic effect is due to the optimal compensation between charge regulation, specific binding and counterion release. The potential use of these carriers for cancer drug delivery will be discussed.

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