

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Surface binding of polymer coated nanoparticles: Coupling of physical interactions, molecular organization, and chemical state
RIKKERT NAP, IGAL SZLEIFER, Northwestern University, Department of Biomedical Engineering — A key challenge in nanomedicine is to design carrier system for drug delivery that selectively binds to target cells without binding to healthy cells. A common strategy is to end-functionalize the polymers coating of the delivery device with specific ligands that bind strongly to overexpressed receptors. Such devices are usually unable to discriminate between receptors found on benign and malignant cells. We demonstrate, theoretically, how one can achieve selective binding to target cells by using multiple physical and chemical interactions. We study the effective interactions between a polymer decorated nanosized micelle or solid nanoparticle with model lipid layers. The polymer coating contains a mixture of two polymers, one neutral for protection and the other a polybase with a functional end-group to optimize specific binding and electrostatic interactions with the charged lipid head-groups found on the lipid surface. The strength of the binding for the combined system is much larger than the sum of the independent electrostatic or specific ligand-receptor binding. The search for optimal binding conditions lead to the finding of a non-additive coupling that exists in systems where chemical equilibrium, molecular organization, and physical interactions are coupled together.

Rikkert Nap
Northwestern University, Department of Biomedical Engineering

Date submitted: 15 Nov 2013

Electronic form version 1.4