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# Selective Self-Organization of Colloidal Particles

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## Personnel

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## Sponsorship

CMSE

Submicron sized colloidal particles have been selectively self-organized into patterned arrangements on a substrate using a novel technique. At the substrate, a polyelectrolyte multilayer film has been deposited onto a chemically patterned surface; subsequently, the polyelectrolyte surface is immersed in an aqueous colloidal suspension of bare  $\text{SiO}_2$  microspheres or functionalized polystyrene latex particles. The colloids self-organize at the surface, driven by the spatially-varied electrostatic and secondary interactions between the colloid and the substrate. The polyelectrolyte platform provides a strong bond to the colloids, imparting mechanical robustness which enables post-processing of the patterned assemblies. The polyelectrolyte also resents the feasibility of introducing functionality into the underlying layers. We have demonstrated control over the density and selectivity of particle adsorption. Three mechanisms have been used to control adsorption: (i) pH of the colloid suspension, which determines the ionization of the uppermost surface of the polyelectrolyte multilayer; (ii) ionic strength of the suspension, which determines the extent of charge screening about the colloid and polyelectrolyte; and (iii) concentration of added surfactant, which causes charge screening and introduces hydrophobic interactions between the surfactant and polyelectrolyte. Using a patterned polyelectrolyte, we have demonstrated self-assembly of single-particle chains of polystyrene latex spheres. We are investigating an energy model for the sequential adsorption process.

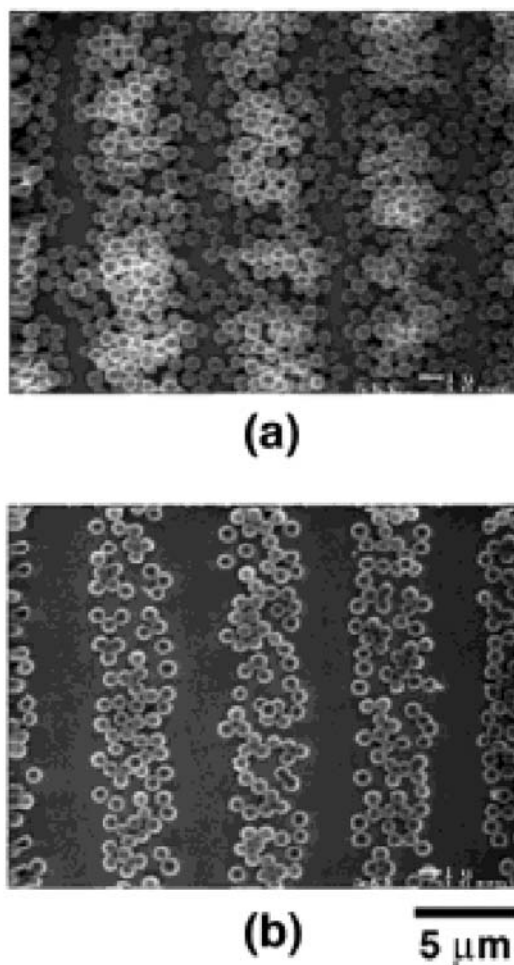


Fig. 39: SEM micrographs of  $\text{SiO}_2$  microspheres bound by electrostatic attraction onto an underlying patterned polyelectrolyte at (a) pH = 6.8 and (b) pH = 8.1.

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