Effect of substrate on the formation of polyelectrolytes multilayers

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For the past twenty years, the Layer-by-Layer technique (LbL) has made it possible to modify surfaces by covering them with thin films. This technique gives the opportunity for a wide variety of potential applications for polyelectrolyte multilayers (PEM), for example chemical reactors, antireflective coatings, microcontainers or filtration membranes.

The deposition of PEMs is influenced by various parameters, such as ionic strength, pH value and charge density. But a systematic study of the substrate effect on the PEM is still missing. Especially, for hybrid/composite materials the connection (interphase) between the PEM and a solid material is important. This addresses planar surfaces like metal or semiconductors as substrates, but also solid particles. For this purpose different substrates were studied by directly changing the nature of the substrate (Silicon or Gold), but also by chemical modification of the silicon surface using silanization (change of both substrate charge and interactions with polyelectrolytes). For polyelectrolytes we chose to use the two most widely spread systems, PSS/PAH and PSS/PDADMAC.

The properties of the PEM are monitored after the deposition as a function of the number of layers by a complementary use of ellipsometry (with humidity control) and AFM and during deposition QCM-D. These techniques allow a very precise study of the interphase between the substrate and the PEM. The question is, how far and how strong the structure of the PEM is affected by the substrate.