11:00 – 11:35

Controlled Deposition of Biomolecules on Solid Surfaces and Between Electrodes

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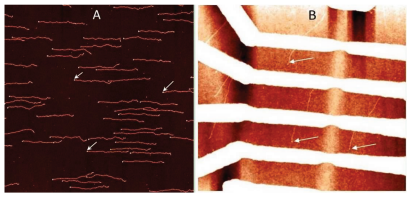

Electrical measurements require controlled deposition of molecules across metal electrodes. DNA and other biomolecules (like, for example, bacteriophages) cannot bind to bare mica and silicon surfaces due to electrostatic between the substrates and the molecule. Treatment of mica with Mg-ions and silicon with aminosilanes reverses the charge of both the above surfaces from negative to positive and enables binding of negatively charged species. Strong charge-mediated interactions with the surface however may cause significant disruption of the structure of soft biomolecules and reduce their ability to conduct electrical current.

In the talk, I'll introduce a novel method for DNA deposition on non-modified mica and silicon surfaces that we have recently developed. The initial binding to the surface occurs through the avidin molecule attached to the end of the DNA. This positively charged protein anchors the complex to mica and silicon surfaces. Drying of the surface with nitrogen yielded molecules aligned in the direction of the gas flow (left panel). Using this approach we deposited DNA across metal electrodes (right panel). Electrical conductivity measurements through these molecules are underway.

Atomic Force Microscopy image of avidin-DNA on mica (A) and crossing a gap between platinum electrodes (B). Avidin-DNA solution in 20 mM LiCl was dropped on a mica surface (A) or a silicon wafer (B). The surfaces were rinsed with double distillate water and dried by nitrogen gas. The arrows show avidin molecules attached to DNA.