DNA oligomer binding in competition reveals interactions beyond stacking

Mina Mohammadi-Kambs and Albrecht Ott

Biological Experimental Physics, Saarland university, Saarbrücken, Germany

DNA hybridization, the binding of two complementary DNA single strands forming a double helix, is a highly sequence specific molecular recognition process that plays important roles in biology and nanotechnology. However, DNA binding in complex situations in presence of the competing partner is poorly understood. We find that the ratio of the binding affinities in competition changes compared to pairwise measurements. This is the signature of the interaction among the competitors on the probe. We additionally compare the pairwise binding constants of DNA oligonucleotide strands from fluorescence anisotropy to the values from fluorescence correlation spectroscopy. For a specific case with a mismatched sequence we observe that the binding constants from both techniques differ by two orders of magnitude. We emphasize that the situations beyond a simple helix formation require careful interpretation, considering the employed measurement technique and the type of interaction at the binding site. These situations may involve other molecular conformations than an undisturbed double helix.