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DNA Surface Hybridization Regimes RASTISLAV LEVICKY, Polytechnic University, PING GONG, Columbia University — Surface hybridization reactions, in which sequence-specific recognition occurs between immobilized and solution nucleic acids, are routinely carried out to quantify and to interpret genomic information. At a surface, molecular interactions are amplified by the two-dimensional nature of the immobilized layer which focuses the nucleic acid charge and concentration to levels not encountered in solution, and which impacts the hybridization behavior in unique ways. We find that, at low ionic strengths, an electrostatic balance between the concentration of immobilized oligonucleotide charge and solution ionic strength governs the onset of hybridization. As ionic strength increases, the importance of electrostatics diminishes and the hybridization behavior becomes more complex. Suppression of hybridization affinity constants relative to solution values, and their weakened dependence on the concentration of DNA counterions, indicate that the immobilized strands form complexes. Moreover, an unusual regime is observed in which the surface coverage of immobilized oligonucleotides does not significantly influence the hybridization behavior, despite physical closeness and hence compulsory interactions between sites. These results are interpreted and summarized in a diagram of hybridization regimes.

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