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Label-less Fluorescence-based Detection for DNA Microarray SANJUN NIU, GAURAV SINGH, RAVI SARAF, University of Nebraska - Lincoln — Microarray technology is the key to rapid, inexpensive gene sequencing that is the corner stone of modern medicine with the potential to diagnose disease before clinical signs and personalize medicine. By coupling light scattering and fluorescence, we describe a quantitative, label-free assay for microarray analysis with a dynamic range of 1 in 10^4 at signal-to-noise ratio of 3:1. Since light scattering is intrinsically proportional to number of molecules, the change in fluorescence is highly linear with respect to percent binding of single stranded DNA (ssDNA) target with the immobilized ssDNA probes. Since the scattering is proportional to fourth power of refractive index, the detection of binding is an order of magnitude more sensitive compared to other optical methods based on change in thickness and refractive index, such as, reflectivity, ellipsometry and surface-plasmon resonance. Remarkably, polystyrene film of optimum thickness of 30 nm is the best fluorescent agent since its excitation wavelength matches (within 5 nm) with wavelength for the maximum refractive index difference between ssDNA and dsDNA.

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