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Single Molecule Visualization of DNA in Wicking Flows CHAD DELONG, DAVID HOAGLAND, University of Massachusetts - Amherst — An understanding of polymers in flow through micro- and nano-structured materials is critical to the success of bioseparations (proteins, DNA, etc.). An open, nanofluidic system has been developed to drive flow through a packed bed of colloidal particles using capillary forces (wicking), allowing the study of polymer dynamics in the absence of the electric field is typically used to drive micro- and nano-fluidic flows. This is especially important when dealing with charged molecules whose confirmation can be affected by the electric field or those insoluble in water. Single molecule imaging is performed in this system on fluorescently labeled DNA using an optical microscope equipped with a fluorescent light source, image intensifier, and CCD camera. Chain elongation in the flow depends sharply on flow rate, with fully relaxed configurations observed below a critical flow rate. At high flow rates, flow induced degradation can be seen. Molecular entanglements with the separation matrix cause molecular weight separation because longer molecules elongate in the flow and become entangled, leading to a longer retention time.

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