Abstract Submitted for the MAR10 Meeting of The American Physical Society

pH/ion nanosensors with optical tweezers in a lab-on-a-chip¹ MARK KENDRICK, WHITNEY SHEPHERD, JESSICA GIFFORD, DANIEL GRUSS, DAVID MCINTYRE, OKSANA OSTROVERKHOVA, VALERIYA BY-CHKOVA, ALEXEY SHVAREV, NATALIA PYLYPUIK, MYRA KOESDJOJO, VINCENT REMCHO, Oregon State University, SHALINI PRASAD, Arizona State University, SCOTT REED, University of Colorado at Denver — We present a labon-a-chip measurement platform for monitoring pH and other ion concentrations of solutions in a microfluidic device or within biological cells, with high spatial resolution. We have developed a variety of polymeric pH/ion sensitive nanoparticles (ion optodes), or 'nanosensors', that can be synthesized *in situ* within a microfluidic device. These ion optodes exhibit fluorescence spectra that change with the pH/ion concentration of the surrounding environment. We optically trap and manipulate several nanosensors, either in microfluidic channels or within biological cells, using holographic optical tweezers and simultaneously monitor fluorescence emission spectra from individual nanosensors. Changes in the fluorescence spectra of the optically trapped ion optodes provide information on spatial and temporal changes in either the pH or ion concentrations in the microfluidic channel or biological cell.

¹Supported by ONR grant N0014-07-1-0457.

Mark Kendrick Oregon State University

Date submitted: 28 Nov 2009

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