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Optical Detection and Magnetic Manipulation of Drops in Microfluidic Devices CHARLES KERBAGE, KEUNHO AHN, TOM HUNT, ROBERT WESTERVELT, DAVID WEITZ, Physics Department and Division of Engineering and Applied Scicence, Harvard University, Cambridge, MA, 02138 — We demonstrate an integrated magneto-optic microfluidic device for drop detection and sorting. Optical detection of water drops formed in a continuous oil phase flow is performed using optical fibers which are integrated into the channels of the PDMS (Polydimethylsiloxane) based microfluidic device. The size and the velocity of the drops can be determined by measuring the transmission intensity as a function of time. We also show that such a device can be used to detect fluorescent materials introduced in the drop itself. Moreover, introducing nano-scale magnetic particles into the water drops allows for drop sorting by means of a magnetic field gradient. This magnetic field is generated through thin film permalloy integrated into the device itself and tuned by an external coil. We show that the sorting depends on the magnetic field gradient, material composite and volume fraction of the magnetic material in the drops.

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