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Developing on-chip methods for the manipulation of particles using conventional and traveling wave dielectrophoresis A. KUMAR, A. ACRIVOS, The Levich Institute, City College of New York, B. KHUSID, New Jersey Institute of Technology, C. JAMES, SNL — We present the design of a microfluidic device, electrical circuits and an ac electrical power supply capable of combining both conventional (DEP) and traveling wave dielectrophoresis (tw-DEP) in a single microchip for the consecutive separation and manipulation of suspended particles according to their electrical properties. The microfluidic device is fabricated using two microchips, having interdigitated microelectrodes, and the microchips were aligned parallel to each other to form the fluidic chamber. The electrode width and inter-electrode spacing for both chips are 20-microns. In contrast to previous studies on traveling-wave dielectrophoresis where the amplitude of the applied voltage was limited to 20Vp-p, we have assembled an advance electrical power supply, using a dual channel function generator and two voltage amplifiers, capable of producing four sinusoidal signals, with each signal shifted in phase from the previous by 90 degrees, with voltage amplitude of up to 200 V (peak-to-peak) and frequency of up to 250 kHz. During this talk, we will present the operating principle of the device for different electric field configurations, for dielectrophoresis and traveling-wave dielectrophoresis, along with the experimental results on suspensions of 3 micrometer diameter latex particles dispersed in an aqueous medium.

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