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Reversible Trapping of Colloids in Microgrooved Channels by Diffusiophoresis under steady-state solute gradients: An Experimental and Numerical Investigation NAVAL SINGH, GORAN T. VLADISAVLJEVIC, Dept. of Chemical Engineering, Loughborough University, UK, FRANCOIS NADAL, Dept. of Mechanical Engineering, Loughborough University, UK, CECILE COTTIN-BIZONNE, CHRISTOPHE PIRAT, Universite Claude Bernard Lyon 1 - CNRS, France, GUIDO BOLOGNESI, Dept. of Chemical Engineering, Loughborough University, UK — In recent years, an increasing interest in harnessing the chemical energy has led to the exploration of colloidal particle manipulation by diffusiophoresis (DP) in microfluidic devices. In this study, we report a novel mechanism for reversible trapping of particles in dead-end micro-structures via steady-state solute gradients in a continuous flow setting. A microchannel was made of an optical adhesive glue and fitted with a transverse microgrooved wall. The charged fluorescent colloidal particles were accumulated within the microgrooves by pumping parallel electrolyte solutions into the device junction. The spatial distribution of particles within the channel was characterized via confocal microscopy and numerical investigation show that particles accumulate within the flow recirculation region beneath the groove entrance due to DP transport and hydrodynamic effects. The particles can be cyclically trapped into and released from the grooves by controlling the salt concentration via a flow switching valve. The proposed method offers great potential for microfluidic bio-analytical testing applications including signal amplification.

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