

# Magnetic Droplets – On-Chip Generation and Manipulation in Continuous Flow

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Monodisperse droplets can be conveniently generated within microfluidic channels and many applications have been demonstrated ranging from biological assays, to kinetic studies and photo-polymerisation [1]. Magnetically functionalised droplets have so far received little attention, with most microfluidic examples involving pipetting in open tray systems [2].

Here, we report the on-chip generation and downstream manipulation of monodisperse magnetic droplets in continuous flow. Using small stationary magnets, ferrofluid droplets were (i) deflected across a chamber for sorting based on applied field and magnetite loading and (ii) split into enriched and depleted daughter droplets. Microfluidic devices were fabricated from glass and silanised with a perfluorocarbon. Aqueous ferrofluid was merged with a fluorocarbon continuous phase to form monodisperse droplets (fig 1a). For deflection studies, droplets were introduced into a chamber with a perpendicular magnetic field; depending on flow rate, magnetic field strength and magnetite content, droplets could be guided to different outlets (fig 1b). Splitting of droplets into two daughter droplets was achieved at a branching junction (fig 1c); magnetite enrichment and depletion were studied at different flow rates and magnetic fields.

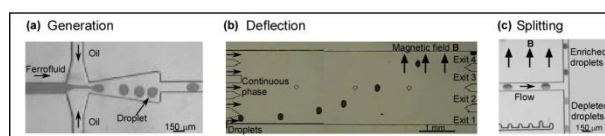


Figure 1. (a) Continuous flow generation, (b) deflection and (c) splitting of magnetic droplets on chip.

## **References:**

[1] S.Y. Teh, R. Lin, L.H. Hung and A.P. Lee, *Lab Chip*, **2008**, *8*, 198.

[2] U. Lehmann, C. Vandevyver, V.K. Parashar, M.A.M. Gijs; *Angew. Chem. Int. Ed.*, **2006**, *45*, 3062.