

Evaluation of the capture efficiency of static and dynamic plugs by fluorescence measurements

Perfusion of the dynamic bead plug increases the exposure of the functionalized bead surfaces to the analyte flow. Furthermore, the speed of the magnetic particles (typically 0.5 to 1.5 mm/s) is about 3 orders of magnitude higher than typical protein diffusion velocities (in the range of a few $\mu\text{m}/\text{s}$). Analyte capture is therefore not limited by the intrinsic diffusion time towards the bead. These important features result in improved capture efficiency. This could be demonstrated in a semi-quantitative manner using fluorescent detection of fluorescein isothiocyanate (FITC)-conjugated anti-streptavidin (Rockland, Gilbertsville, PA, USA) capture on the streptavidin-coated beads. Perfusion with the analyte solution was carried out with a dynamic plug (actuated at 70 Hz) and with static dense plugs on the channel walls (0 Hz), respectively. For the antigen capture, a volume of 250 nL analyte solution ([5 $\mu\text{g}/\text{mL}$]) was driven through the microchannel during 100 s. Fluorescent detection was always performed in the dynamic actuated plug mode (see Fig. S3a)

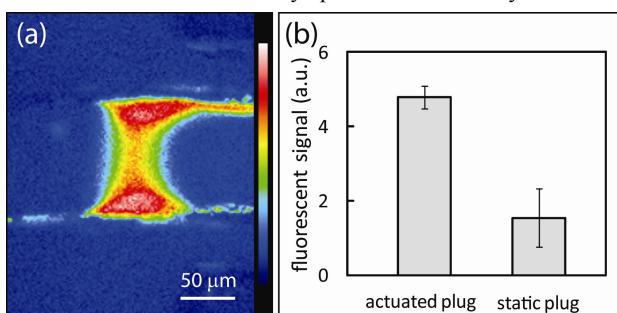


Fig. S3 a) The fluorescent signal is recorded as mean value in the dynamic mode after capture of the analyte. b) Increase of the capture efficiency with the dynamic bead plug with respect to static plugs. FITC-conjugated anti-streptavidin capture on streptavidin coated beads is detected for both configurations.

in order to compare average signals for both capture modes. Fig. S3b compares the two capture modes and shows an about 3-fold increase of the fluorescent signal for analyte capture in the dynamic mode. Static bead plugs on the channel side walls clearly entail weak perfusion by the analyte flow and reduced capture efficiency.