

## Electronic Supplementary Information

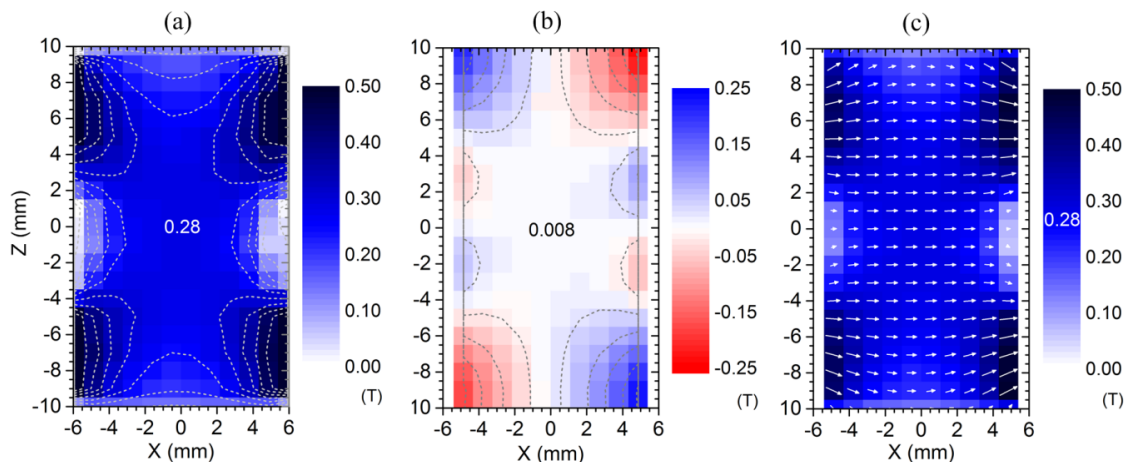
### **Mixing control by frequency variable magnetic micropillar**

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**Fig. S1** Magnetic field induction  $B$  measured on the frontal cross-section, where the pillar is actuated. (a) Induction component in X-axis direction. (b) Induction component in Z-axis direction. (c) Superimposed induction vector map with arrows showing the local direction of magnetic field lines and the strength of line segments indicating the magnitude of the local magnetic induction.

**Video S1:** This supplementary bright-field video records the micropillar actuation in an unsealed microchannel from the side view. The alternatively visible dark objects are the pair of permanent magnets and the rotating direction is clockwise. The actuation frequency is 79.7 Hz. The playback frame rate is 30fps.

**Video S2:** This supplementary bright-field video records the micropillar actuation in the micromixer from the bottom view. The actuation frequency is 161.6 Hz. The playback frame rate is 30fps.