Electronic Supplementary Material (ESI) for RSC Advances.


# Electronic Supplementary Information for

# Continuous detection of trace level concentration of oil droplets in water using microfluidic AC electroosmosis (ACEO)

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## S1. Image Processing for the calculation of the enrichment efficiency

ImageJ (National Institutes of Health, USA) , an open-source image processing software was used for estimating the enrichment efficiency. A similar image processing scheme was used by Conn, Ma, Hirasaki and Biswal, 2014[1] for quantifying oil displacement mechanism in microfluidic device. First, 8-bit images of the circular entrapment were taken using the high-speed camera when the electric field is off and after the electric field is turned on. This is shown in Fig. (a) and (b). The above images (a) and (b) were obtained when the applied AC signal is 200 V and 100 Hz.

After obtaining the raw images, thresholding (c) of the images was determined in ImageJ for increasing the contrast and for accentuating the finer details in the image. This was followed by selection (d) of the oil droplets and counting the pixels within the selected oil droplets. Finally, the enrichment efficiency was determined by

$$\frac{[P(t) - P_o]}{P_o} * 100$$

where P(t) is the pixel count at time,t seconds and $P_o$ is the pixel count before the electric field is applied and the pixel counting is done within the oil phase only. In the images shown in Fig. 8, $P_o$ = 9438 and P(t=6s)=13931, so the enrichment efficiency obtained using the above equation is 47.6%.

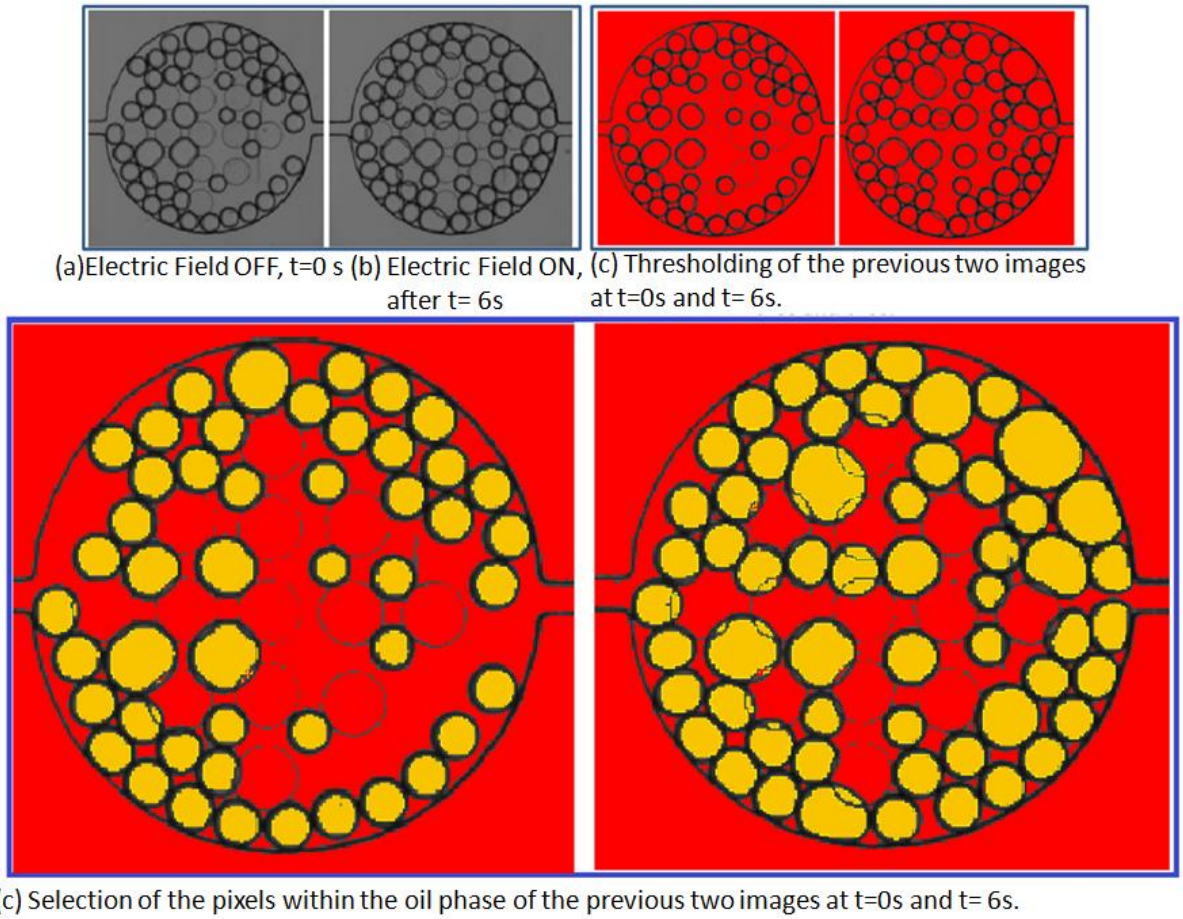


**Fig. S1** shows the protocol for obtaining the entrapment efficiency via image processing.

## Reference

1. C. A. Conn, K. Ma, G. J. Hirasaki and S. L. Biswal, *Lab Chip*, 2014, 14, 3968-3977.