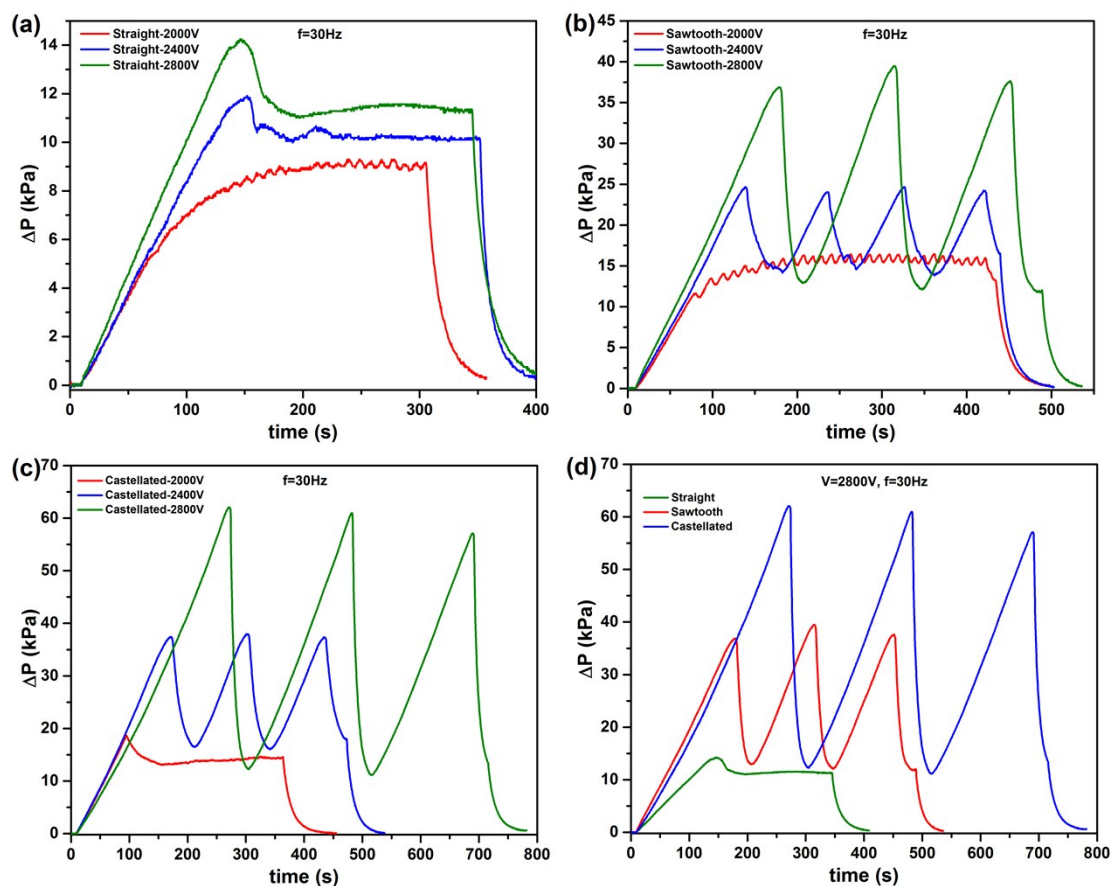


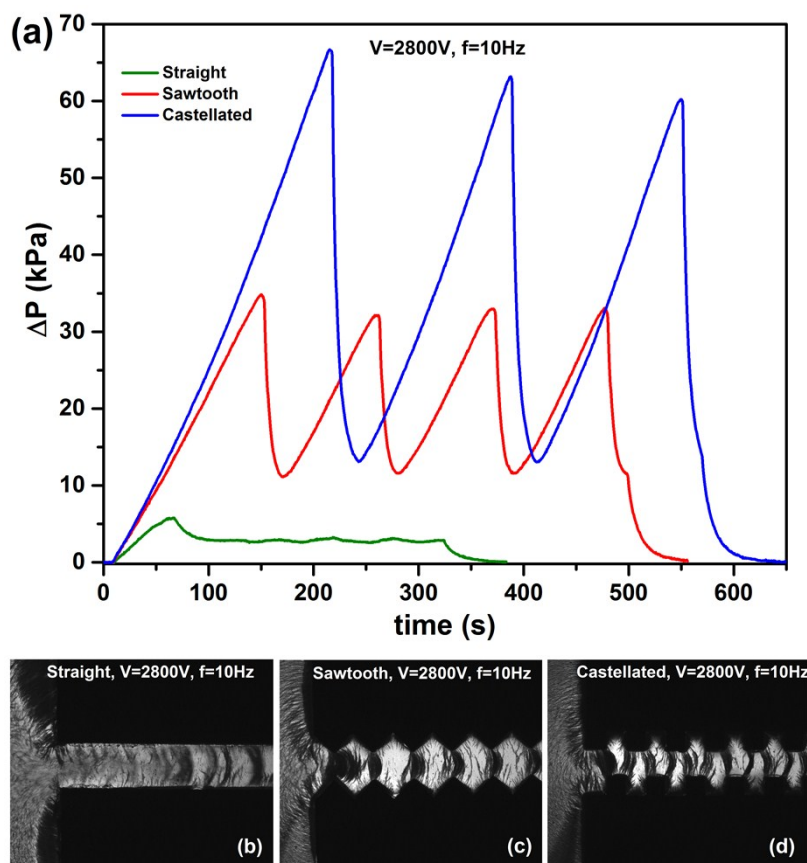
# Significant Enhancement of the Electrorheological Effect by Non-Straight Electrode Geometry

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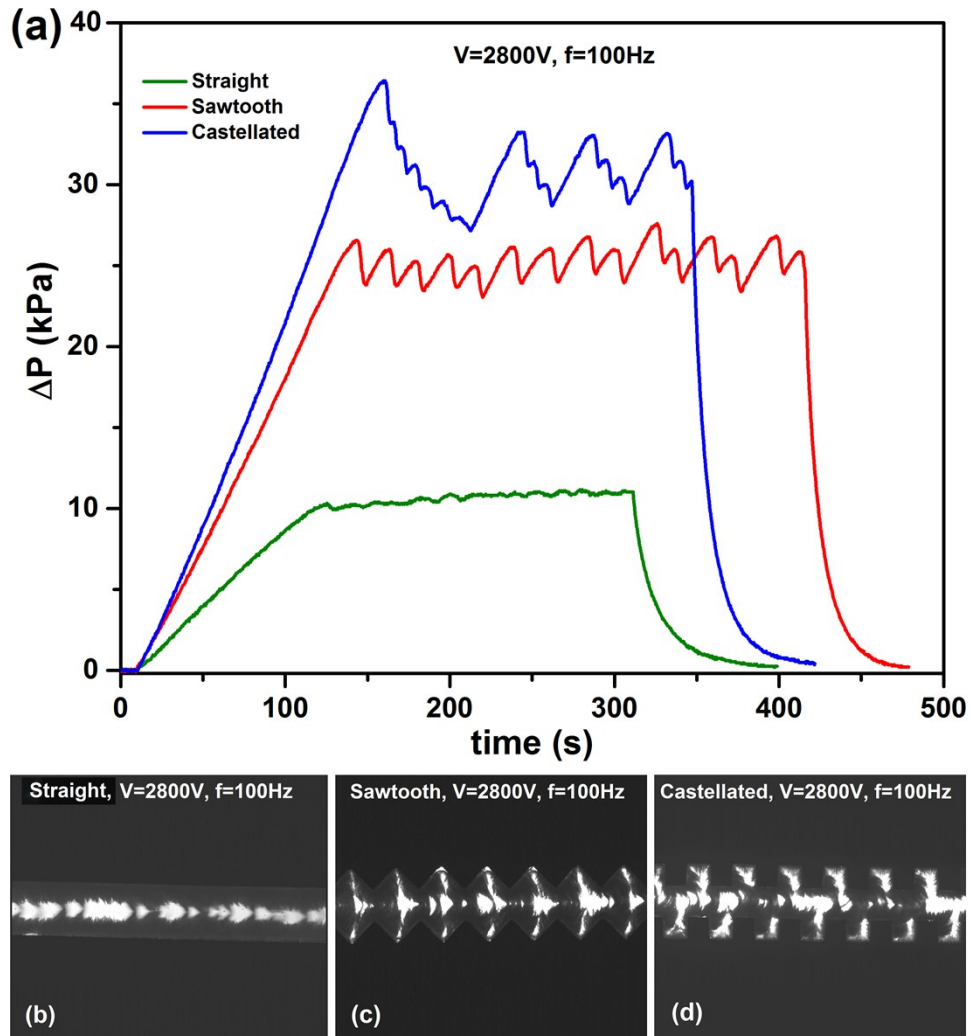
## Supporting Information



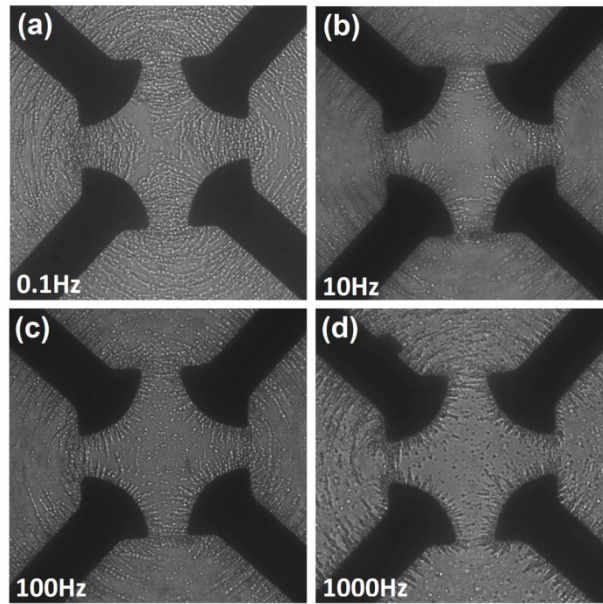
**FIG. S1.** Comparison of the pressure drops as a function of time upon step-wise application of voltage for (a) straight, (b) sawtooth and (c) castellated electrodes. (d) Comparison between the different electrode geometries at the same applied voltage of 2800V, clearly showing a significant enhancement of the ER effect with the non-straight electrodes. The frequency in these measurements was 30Hz.



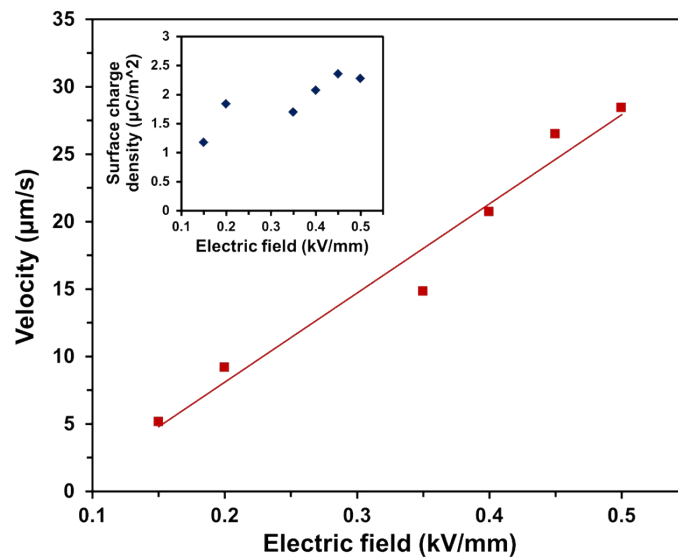
**FIG. S2.** (a) Comparison of the pressure drops between the different electrode geometries at the same applied voltage of  $V=2800\text{V}$  and  $f=10\text{Hz}$ . Corresponding microscopy image of chains behavior (after  $t=10\text{s}$ ) for the (b) straight, (c) sawtooth and (d) castellated electrodes.



**FIG. S3.** (a) Comparison of the pressure drops between the different electrode geometries at the same applied voltage of  $V=2800\text{V}$  and  $f=100\text{Hz}$ . Corresponding microscopy image of chains behavior (after  $t=160\text{s}$ ) for the (b) straight, (c) sawtooth and (d) castellated electrodes.



**FIG. S4.** Microscopy image showing the positive DEP response of the particles in the quadrupolar electrode setup under an AC electric field  $E=4\text{kV/mm}$ , with a frequency of (a) 0.1Hz, (b) 10Hz, (c) 100Hz and (d) 1000Hz.



**FIG. S5.** Measured average particle electrophoretic velocity versus DC electric field intensity. The volumetric concentration of the particles is diluted to 0.01% with silicone oil to facilitate the visualization of individual particles. The inset depicts the calculated surface charge density of the particles.

**Videos:**

**Video 1:** The positive DEP response of the particles in the quadrupolar electrode setup under an AC electric field  $E=4\text{kV/mm}$ , with frequencies of  $0.1\text{Hz}$  and  $5000\text{Hz}$ .

**Video 2:** The shearing behavior of the chains in the straight electrode without blockage, under the same conditions as Fig.4(b).

**Video 3:** The behavior of the chains in the sawtooth electrode, demonstrating the chains are docked at the tip of the electrode, under the same conditions as Fig.4(c).

**Video 4:** The oscillatory behavior of the chains in the castellated electrode, demonstrating the chains are docked at the tip of the electrode, under the same conditions as Fig.4(d). The oscillatory blockage of the channel corresponds to the oscillations of the pressure response in Fig.2. The frame rate was four-times of that of the original video.

**Video 5:** The electromigration of the particles under applied DC electric field ( $E=0.4\text{kV/mm}$ ). The Rheoil 4.0 was diluted to  $0.01\%$  vol. with silicone oil for better visualization.