

# Non-coalescence of oppositely charged water drops during electrostatic dehydration of petroleum

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Electric fields are widely used to accelerate the coalescence of emulsified water droplets in oil, e.g., within the electrostatic dehydrators used in the petroleum industry. We have identified and investigated two previously unsuspected phenomena that affect the coalescence process. First, we have determined that so-called “stagnant caps” composed of surfactant molecules at the oil/water interface are responsible for dynamically altering the drag coefficient of charged water droplets approaching one another (cf. images at right). Second, we have established that charge transfer during electrically induced “partial coalescence” is dominated by convective effects associated with a capillary-pressure induced vortex (cf. image below). A fundamental understanding of both will help optimize separation efficiency of water from petroleum within electrostatic dehydrators.

