

High voltages generated by sliding drops

Slide electrification is a spontaneous charge separation between a substrate and a sliding drop. Here, we describe this effect in terms of a voltage generated at the three-phase contact line. This voltage is on the order of 0.2-2 kV and moves charges between the drop and the substrate. We model this system by a surface- and drop capacitor connected to the voltage source of the moving three-phase contact line. To model previous drop charge experiments and experiments on more exotic substrates with drop-rate dependent charge polarity, we introduced an adaptation of the contact-line voltage upon water contact. Using this adaptive two capacitor model, we can describe a wide range of experiments, enabling new insights into the molecular details of the charge separation mechanism.

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