

High Voltages Generated by Moving Water Drops

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Water drops sliding on insulating, hydrophobic substrates can become electrically charged [1–3]. Despite many decades of research, this spontaneous electrification of moving drops is still far from being understood. By precisely measuring charge and voltage, we found that moving water drops accumulate a voltage of several kilovolts after sliding for just a few centimeters. To enable an efficient utilization of this simple electric energy generation mechanism, a detailed and quantitative understanding of the underlying physical process would be required. Using a simple electrostatic model, we show that the drop voltage is fundamentally connected to the properties of the electrostatic double layer at solid-liquid interfaces. The observation of high drop voltages will have important implications for energy harvesting applications, as well as droplet microfluidics and electrostatic discharge protection.

[1] A. Z. Stetten, D. S. Golovko, S. A. L. Weber, and H.-J. Butt, Slide Electrification: Charging of Surfaces by Moving Water Drops, *Soft Matter* 15, 8667 (2019).

[2] D. Díaz, D. Garcia-Gonzalez, P. Bista, S. A. L. Weber, H.-J. Butt, A. Stetten, and M. Kappl, Charging of Drops Impacting onto Superhydrophobic Surfaces, *Soft Matter* 18, 1628 (2022).

[3] X. Li et al., Spontaneous Charging Affects the Motion of Sliding Drops, *Nat. Phys.* 1 (2022).

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Sitzung Einordnung: Short Talks