

Exploring in-plane interactions beside an adsorbed molecule with lateral force microscopy

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Hydrogen, the smallest and most abundant element in nature, plays a vital role in many molecular interactions. Their positions can determine the interactions with neighboring molecules in the form of hydrogen bonds. While atomic force microscopy can image the internal structure of flat-lying molecules, H-atoms are difficult to directly image due to their size. We directly image these H-atoms using lateral force microscopy (LFM). Furthermore, we determine a metric of when the assumption of purely radial atomic interactions breaks down and an additional angular component is required to account for the additional electrostatic interaction from the metal tip apex. The application of LFM to the sides of molecules demonstrates how in-plane molecular interactions can be directly investigated.

[1] Shinjae Nam, Elisabeth Riegel, Lukas Hörmann, Oliver T. Hofmann, Oliver Gretz, Alfred J. Weymouth, and Franz J. Giessibl, *PNAS* **121**(2), e2311059120 (2024).