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Direct measurement of the interaction forces during the sliding of a water droplet on a pillar-typed superhydrophobic surface THANH-VINH NGUYEN, HIDETOSHI TAKAHASHI, KIYOSHI MATSUMOTO, ISAO SHIMOYAMA, Univ of Tokyo — We directly measure the interaction forces between a sliding droplet and a single microstructure of a pillar-typed superhydrophobic surface. The measurement is realized using a MEMS (Micro Electro Mechanical Systems)-based two-axis force sensor fabricated under the micropillar. We find that, during the sliding of a water droplet on the micropillar array, the pillar is pulled upward when it meets the advancing and receding edges of the droplet as a result of the normal component of surface tension. The maximum value of the pulling force at the receding edge is larger than that at the advancing edge due to the difference in dynamic contact angles at the receding and advancing edges. Meanwhile, over the inner region of the contact area, the pillar is pushed down by the liquid pressure. Moreover, measured shear force shows that the friction during the droplet sliding is dominated by the adhesion of the droplet at the receding. Finally, we demonstrate that as the volume of the droplet increases, the normal force over the inner region of the contact area decreases while the forces at the receding edges do not change significantly.

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