

Surface Adhesion and Friction Tester (SAFT)

Measuring static friction and pre-sliding displacement

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Setup

The Surface Adhesion and Friction Tester (SAFT) enables the measurement of microscale static and dynamic friction over sliding distances (μm) for single asperity (ball-on-flat) contacts. It was designed and manufactured to minimize errors associated with the highly precise motion and loading. The developed normal and tangential forces at a contacting pair are measured via contactless capacitive sensors positioned near the flexure-based Force Measurement Mechanism.

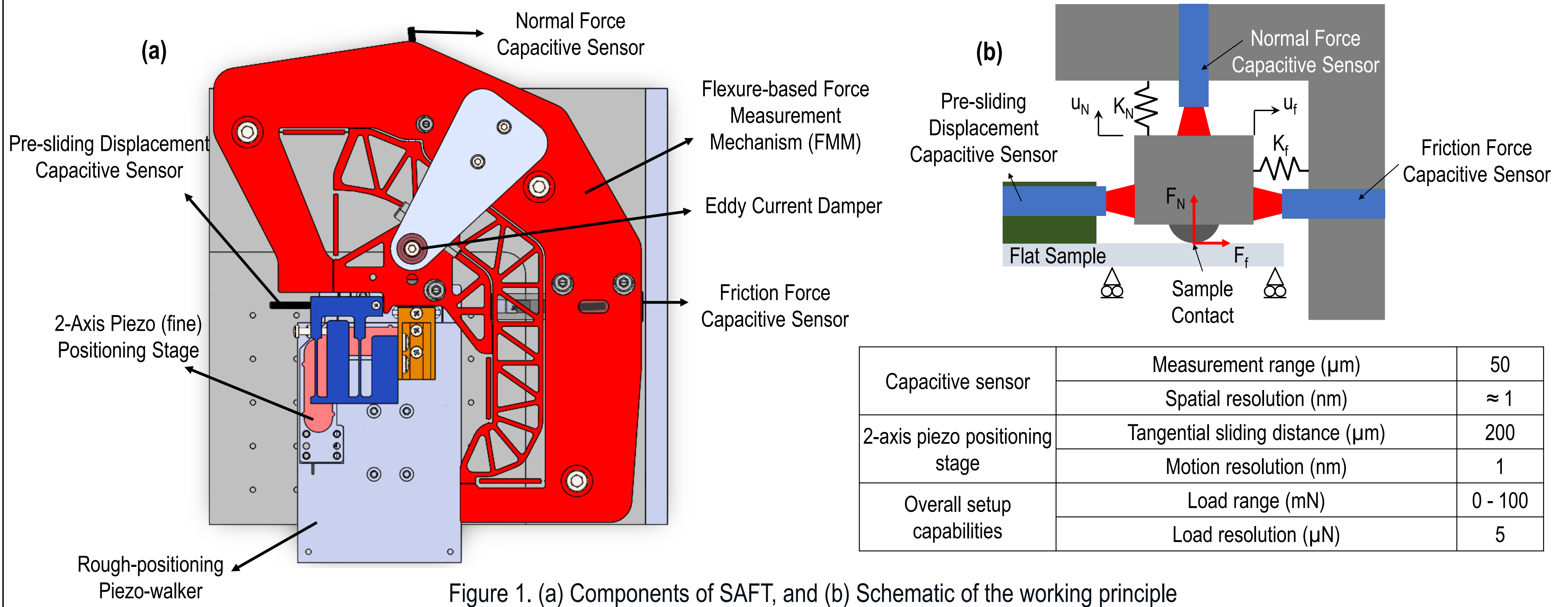


Figure 1. (a) Components of SAFT, and (b) Schematic of the working principle

Experiments

A single asperity is realized as a sphere placed on a flat surface. Contrary to Coulomb friction, Figure 2 shows the non-linear pre-sliding behavior along with the stick to slip transition after the onset of sliding.

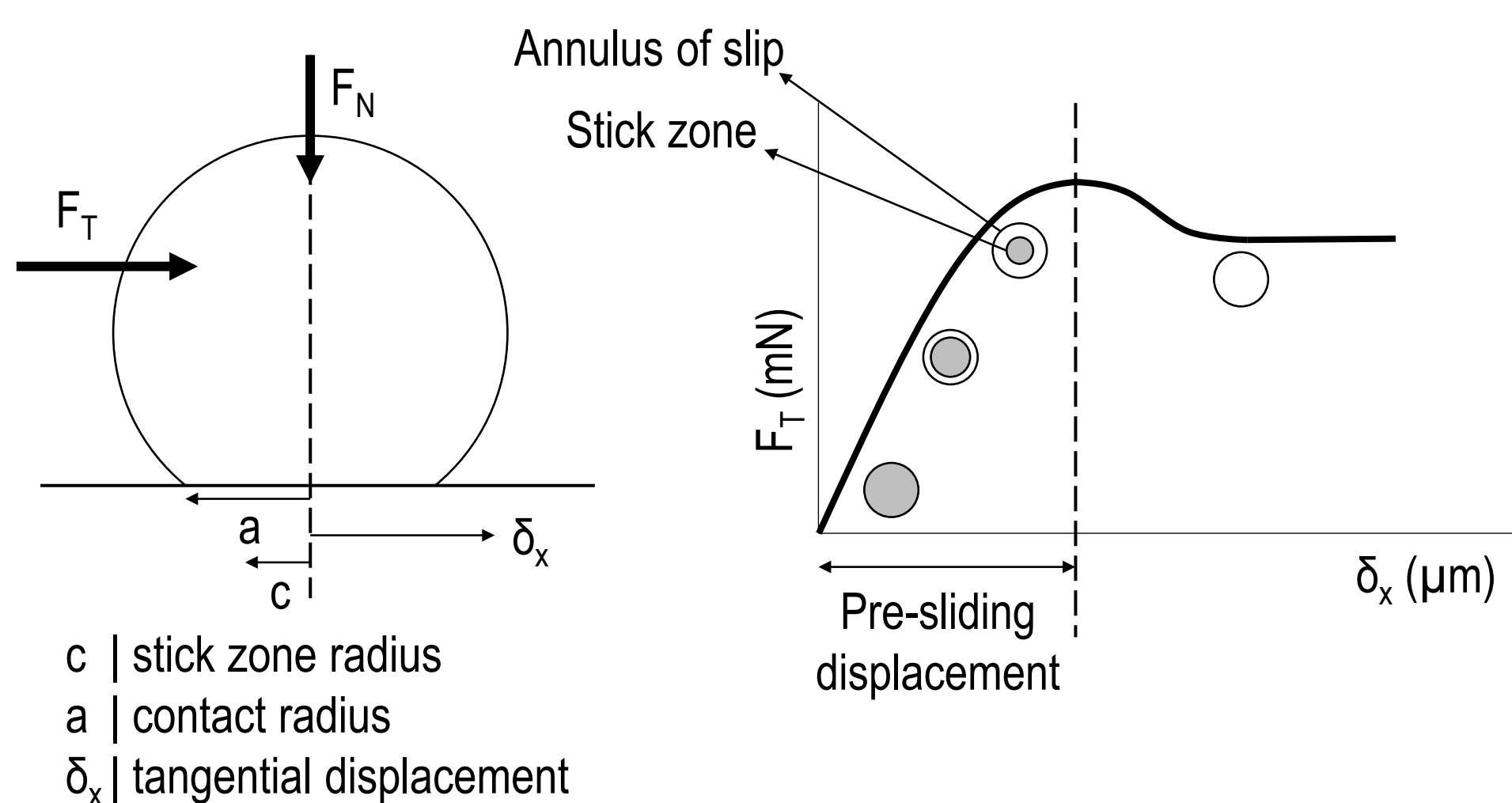


Figure 2: Stick-slip transition for single asperity

Friction hysteresis in the pre-sliding regime might occur in the case of varying oblique forces (Figure 3).

Snap-in and pull-off force measurements (Figure 4) are also essential in understanding the adhesion and mechanical properties of materials at the microscale.

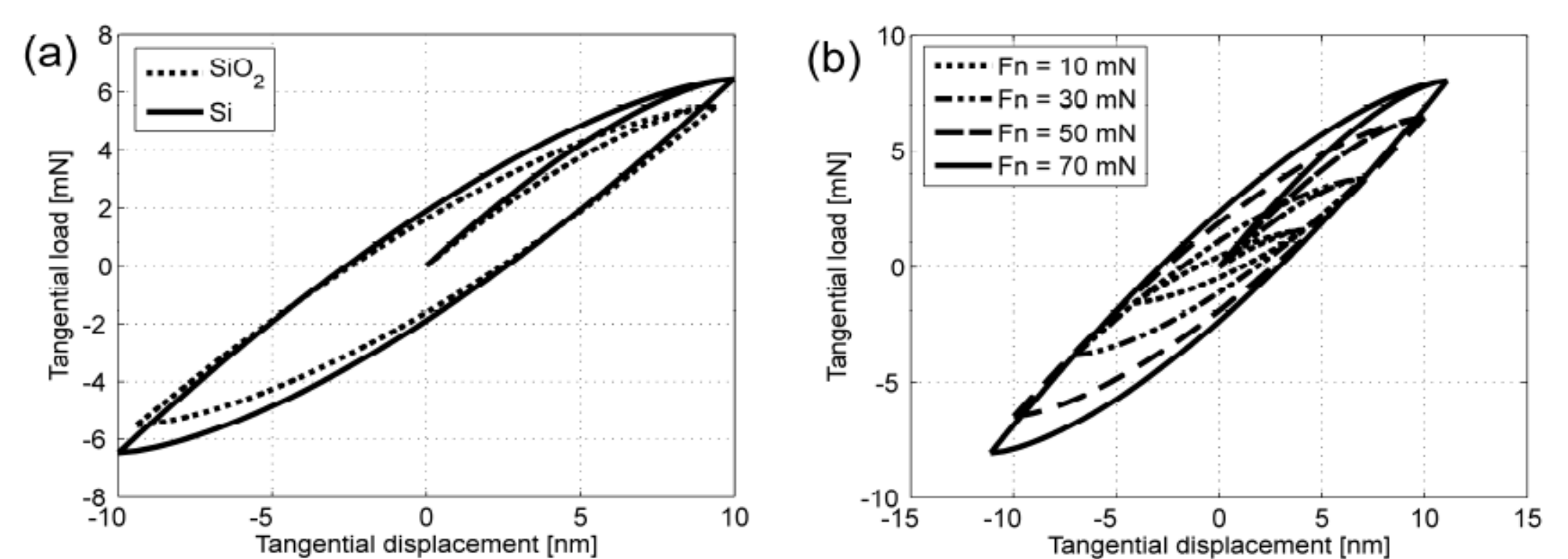


Figure 3: Frictional hysteresis in the pre-sliding regime

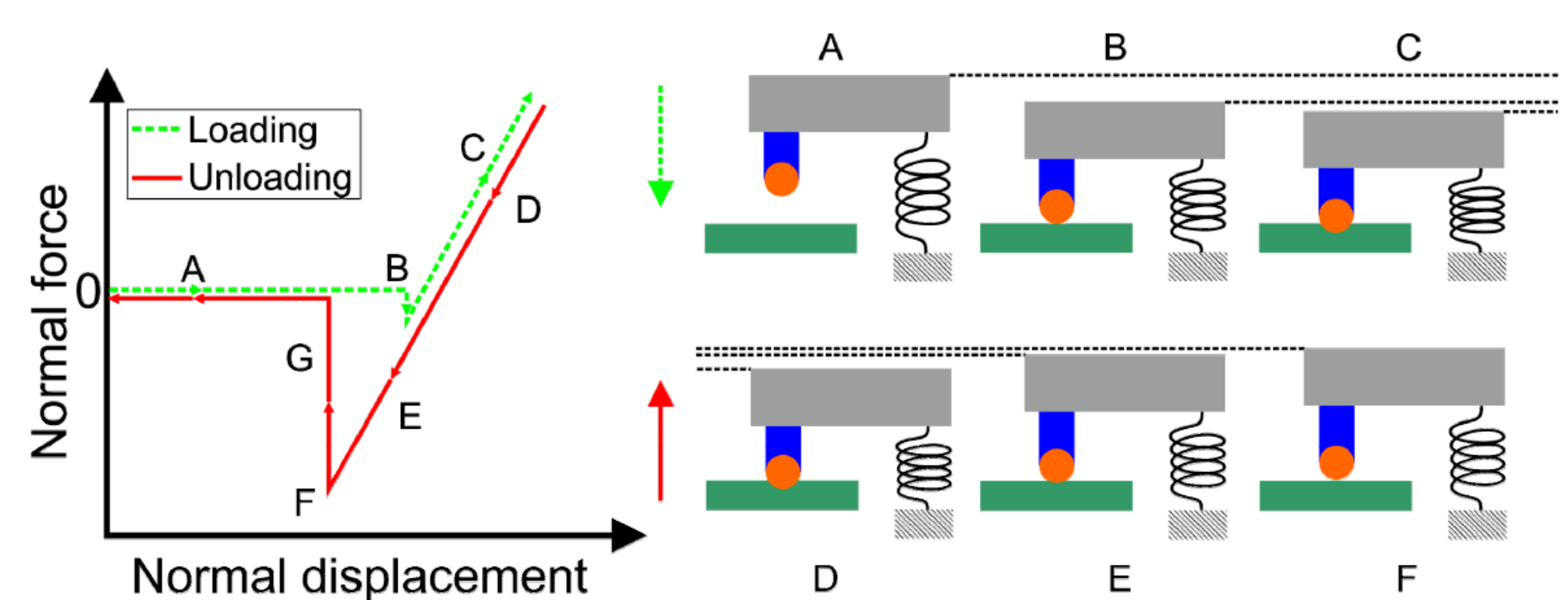


Figure 4: Pull-off and snap-in force measurements for adhesion

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