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Stood-up drops as a novel, easiest and fasted way to measure receding contact angles

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It is well-established that the receding contact angle (CA) plays a vital role in various applications where repelling liquids, preventing fouling, promoting self-cleaning, and drop friction are essential requirements and that it can also provide very relevant information for coating and bonding processes. However, measurements of the receding CA are typically time-consuming, challenging, and necessitate extensive protocols [1]. In this study, we introduce a novel drop deposition method that enables the rapid measurement of the recently receded CA within a few seconds and is entirely user-independent.

The method builds upon the existing "liquid-needle method" used to measure advancing CAs [2,3], wherein a thin liquid jet is meticulously controlled to deposit a droplet on the surface without imparting excess kinetic energy from the dosing process. In contrast to the liquid-needle method for advancing CA, our novel method for receding CA involves the liquid first spreading radially during dosing, forming a pancake-shaped film, and subsequently retracting to form a spherical cap-droplet shape, as illustrated in Figure 1. Consequently, we refer to such droplets as "stood-up drops" (SUD) [4].

We elucidate the crucial dosing parameters necessary to ensure that the contact angle of SUD accurately represents the recently receded contact angle and compares favorably to classically determined dynamic receding contact angles, as depicted in Figure 2. Furthermore, we provide real industrial application examples wherein this straightforward method of receding CA measurement could address production problems hitherto unresolvable with classical (advancing) contact angle measurements.

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