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Opinion

A Universally Defined Standard to Evaluate the Mechanical Stability of Microtextured Surfaces is Necessitated

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Opinion

The poor mechanical stability of microtextured surfaces is a major barrier to their engineering applications [1,2]. Accordingly, researchers have devoted themselves to developing microtextured surfaces with robust mechanical stability. Recently, Wu et al. [3] reported a superhydrophobic coating with a robust hierarchical structure and compared its mechanical stability to that of the other robust surfaces. The authors claimed that the test conditions used to evaluate the mechanical properties were the most rigorous as compared to those used in previously reported tests. As there is no universal standard to quantify the mechanical stability of a surface, the following questions are worth discussing: "how was the comparison carried out?" and "what test conditions qualify as rigorous?"

Currently, several methods have been widely used to evaluate the mechanical stability of microtextured surfaces, including sandpaper abrasion, blade scraping, finger wiping, tape peeling, and sand impact. After these tests are performed, researchers usually use the changes in the Water Contact Angle (WCA) to evaluate the mechanical stability of microtextured surfaces [4]. However, the specific testing methods are many and varied in the literature [3]. For example, the sandpaper abrasion test involves several parameters, such as sandpaper grit, load pressure, movement speed, and cycles or distances. Different researchers tend to use different parameters to conduct abrasion tests [5-10]. The selection of a particular parameter may render the experiment easier to conduct or lead to a better result. These practices make it difficult to compare the mechanical property of a microtextured surface with other robust surfaces.

To overcome the chaotic status quo, researchers need to develop a standard to evaluate the mechanical stability of microtextured surfaces. Again, we consider the case of sandpaper abrasion. The combination of sandpaper grit, load pressure, movement speed, cycles, or distances should have a universal standard. Table 1 shows an assumed and fancied standard, in which sandpaper abrasion tests are classified into two categories, namely: (i) low grit test and (ii) high grit test. The combination of both grits is expected to better demonstrate the mechanical property of a microtextured surface. After the abrasion tests, the changes in the WCA of the microtextured surfaces can be measured. Subsequently, the descent rate of the WCA can be calculated with the following equation:

$$Descent\ rate\ \% = \frac{WCA_{pristine} - WCA_{abrasion}}{WCA_{pristine}} \times 100$$

Table 1: An assumed sandpaper abrasion standard.

Test type	Sandpaper grade (Grit)	Load (g)	Speed (m/s)	Cycles
Low grit	100	250	0.05	50
High grit	1000	250	0.05	50

The microtextured surface with a lower descent rate indicates a higher mechanical stability. In the low- and high-grit abrasion tests, we can obtain two descent rates, which can be used to carry out an effective comparison. Apart from sandpaper abrasion, other test methods (e.g., blade scraping, finger wiping, tape peeling, and sand impact) also need a standard for measurement. If researchers adopt a universal standard, the comparison of the mechanical stability of various microtextured surfaces will be easily achieved.

The purpose of this paper is not to question or criticize the work of Wu et al. [3] because the issue of effectively comparing the mechanical stabilities of different microtextured surfaces is a problem encountered by many researchers. We hope that the above discussion will inspire researchers to create a standard to evaluate the mechanical stability of microtextured surfaces, which will be beneficial to the development of microtextured surfaces.

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