

Accepted Manuscript

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PII: S0165-9936(18)30241-3

DOI: [10.1016/j.trac.2018.09.001](https://doi.org/10.1016/j.trac.2018.09.001)

Reference: TRAC 15237

To appear in: *Trends in Analytical Chemistry*

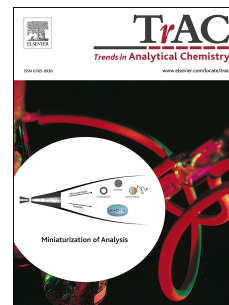
Received Date: 29 May 2018

Revised Date: 3 September 2018

Accepted Date: 3 September 2018

Please cite this article as: S. Zhan, Y. Pan, Z.F. Gao, X. Lou, F. Xia, Biological and chemical sensing applications based on special wettable surfaces, *Trends in Analytical Chemistry* (2018), doi: 10.1016/j.trac.2018.09.001.

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1 **Biological and chemical sensing applications based on special** 2 **wettable surfaces**

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10

11 **Abstract**

12 Special wettable surfaces (SWS, i.e., surfaces with special wettability) are less common in daily
13 life. Some of the frequently studied SWS include those surfaces of homogeneous wettability
14 which are superhydrophobic, superoleophobic, or omniphobic. Additionally, surfaces of patterned
15 wettability which are partially hydrophilic and partially hydrophobic have also been widely
16 investigated. Besides their wide applications in self-cleaning, anti-fogging, water-harvesting,
17 anti-icing, water-oil separation and anticorrosion, the SWS have also been emergingly utilized in
18 biological and chemical sensing in recent years. This review focuses on the SWS-based sensing
19 applications, and classified them into electrical/electrochemical assays, surface-enhanced Raman
20 scattering (SERS) assays, fluorescent/colorimetric assays, and visual assays (i.e. assays based on
21 contact angle). After the main characteristics and performances of these applications were briefly
22 summarized, areas to be improved and direction for future development of this research topic were
23 discussed at the end of the review.

24

25 **Keywords:**

26 Biological/chemical sensing; Special wettable surface; Contact angle; Patterned wettability;
27 Superhydrophobicity.

28

29 **1. Introduction**

30 The special wettable surfaces (SWS) typically refer to those surfaces of which the wetting
31 properties (i.e., wettability) are not commonly encountered in daily life [1]. As a significant
32 property of a solid surface [2], the wettability macroscopically represents the interaction between
33 the substrate solid materials and the fluids or liquids [3]. The basis to study the wettability is the
34 Young's equation which results from the initial study in 1805 [4], and the most direct way to
35 determine the wettability of a surface is by measuring the water/oil contact angle (WCA/OCA) of
36 a sessile liquid droplet on a solid surface in air [3, 5]. Different types of SWS and its
37 corresponding CAs are listed in **Figure 1** [6-11]. With the fast development of material science,
38 chemistry and some other related subjects, the fabrication/design and application of the SWS has
39 become more and more diverse [12, 13]. Generally, the fabrication of the SWS proceeds from by
40 creating a hierarchical rough microstructure, or by modifying the substrate with a layer of
41 chemical coating [14]. And the applications of the SWS extensively covered the area of
42 self-cleaning, anti-fogging, water-harvesting, anti-icing, water-oil separation, anti-corrosion and so

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