Supporting Information

Flexible and Superwettable Bands as a Platform toward Sweat Sampling and Sensing

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Instruments and Characterization

A field-emission scanning electron microscope (SEM, JSM-6700F, Japan) was used for characterizing the morphologies of the nanodendritic silica coatings. Water contact angles (CA) were measured on an OCA20 system (Data-Physics, Germany) at ambient temperature. The O_2 plasma treatment for producing superhydrophilic microwell was performed by a DT-03 plasma processor (Suzhou OPS Plasma Technology Co., Ltd., China) and customized photomasks (Beijing Zhongjingkeyi Technology Co., Ltd, China). A scraping ink bar (OSP-100, Hebei Zhongnuo Instrument Factory, China) was used to evenly apply the silica suspension on polyethylene terephthalate (PET) film (Beijing local store). All the optical photography was captured by a Nikon digital camera.

Fabrication of superhydrophobic silica suspension

The preparation of superhydrophobic silica suspension is based on the coreaction involving surface modification between hydrophobic silica particle and fluoroalkylsilane. Typically, 0.15 g hydrophobic silica power (Degussa) and 0.2 g 1*H*,1*H*,2*H*,2*H*-perfuorooctyltriethoxysilane ($C_8F_{13}H_4Si(OCH_2CH_3)_3$, Beijing Huaweiruike Chemical Technology Co., Ltd, China)) were successively added into 12.4 ml absolute ethanol solution (≥ 99.8%, GR). The mixture was magnetically stirred at 600 rpm for approximately 12 h and ultrasonicated for about 30 min in ambient temperature (25℃) a final semitransparent superhydrophobic silica suspension.

Fabrication of wearable and superwettable sweat sensors

Firstly, a commercial available PET film was cut into ellipse pieces, on which the as-prepared suspension was directly dropped and scrapped evenly by using a scraping ink bar.

The fresh silica coating was naturally dried in ambient environment. Subsequently, the resulting band was etched by oxygen plasma at 180 W for 5min through a home-made photomask. Finally, the covered region remained superhydrophobic; in contrast, the etched spots became superhydrophilic.

Calibration of superwettable chloride, pH, calcium and glucose colorimetric assay.

For pH detection, 0.5 μL litmus solution was drop-cast on the superhydrophilic microwells (1 mm, the same below), fully dried in the fume hood for about 5 minutes, in which 1.0 μL solutions of gradient pH value of 4.5, 5.0, 5.5, 6.0, 6.5 and 7.0 were dispensed. The band was incubated at 37 ℃ (Closed to human body temperature, the same below) in thermostat water bath to allow a sufficient time for the colorimetric response. Finally, we used a cellphone installed with a color extracting app called Color Picker® (Available in both Android and IOS app store) to record the colorimetric profile and analysis the RGB composition of each microdroplet.

Similarly, the chloride assay zone was fabrication by adding 0.4 μL mercuric thiocyanate regent (Chloride Kit, Nanjing Jiancheng Bioengineering Institute, China) on superhydrophilic site, generating a homogeneous light orange spot after volatilization processes. Then 1.0 μL chloride analyte of 0, 20, 40, 60, 80 and 100 mM was carefully drop-cast into the test spots. Similarly, the RGB composition of each chromogenic microdroplet was record by using the same approach as pH.

The glucose detection is based on glucose oxidase (GOx) and potassium iodide (KI) reaction system. To prepare the glucose assay zone, 2.0 μL KI (0.6M) and 2.0 μL GOx (15 U/mL) were dispended on the microwell to immobilize the assay regent upon completely

dried, then 2.0 μL glucose standard solution from 0, 2, 4, 6, 10 to15 mM were added in the analytical zone. Likewise, RGB information of chromogenic microdroplet was analysed using the same approach as pH.

The calcium concentration was colorimetrically determined by the o-cresolphthalein complexone method (Calcium Kit, Jiangsu Feiya Technology Co., Ltd., China). Briefly, 2 μL sodium acetate-ethylene diamine buffer (pH = 11) and 2 μL color reagent were added sequentially to the microwells. After natural evaporation, the 1 μL calcium ion standard solution of 0, 2, 4, 6, 10 and 15 mM were dropped in the assay spots. Corresponding RGB information was finally collected using the similar strategy to pH.

Supporting Figures

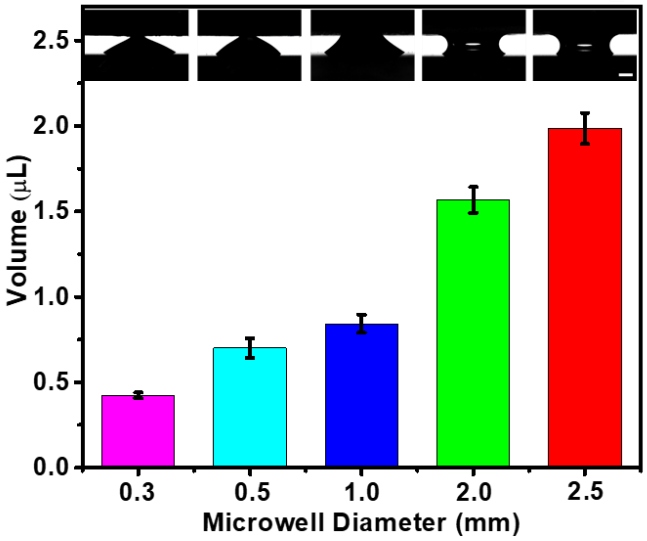

Figure S1. Volume of the captured microdroplets with different diameters of microwells (0.5, 1.0, 1.5, 2.0, and 2.5 mm, scale bar, 500 μm).