SUPPORTING INFORMATION

Trace material capture by controlled liquid droplets on a superhydrophobic/hydrophilic surface

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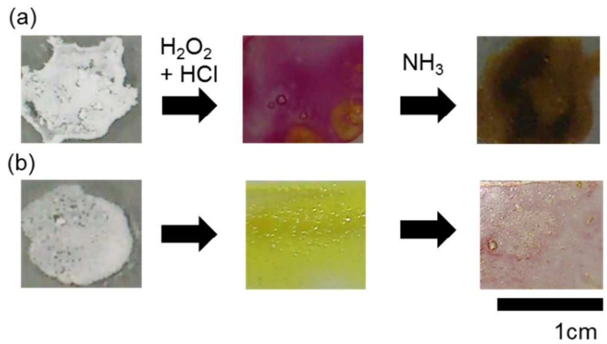

Figure S1 Murexide reaction

(a) Color change of murexide reaction with caffeine. (b) Abacavir which had similar structure with caffeine was also changed from white to yellow or red. Only reaction with H_2O_2 and HCl was utilized in order to simplify the detection procedure.

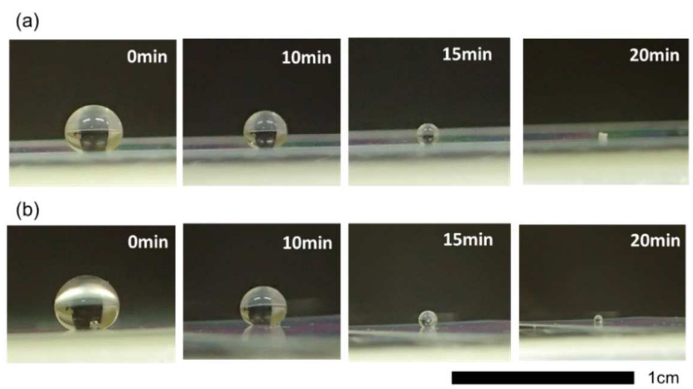

Figure S2 Contact angle during evaporation on a superhydrophobic surface

(a) PVA/SiO_2 10μl was condensed on a superhydrophobic surface for fabricating hydrophilic spot area. (b) Aqueous liquid droplet 10μl was condensed on a superhydrophobic / hydrophilic patterned surface. Water repellent property was kept until the end of full evaporation.

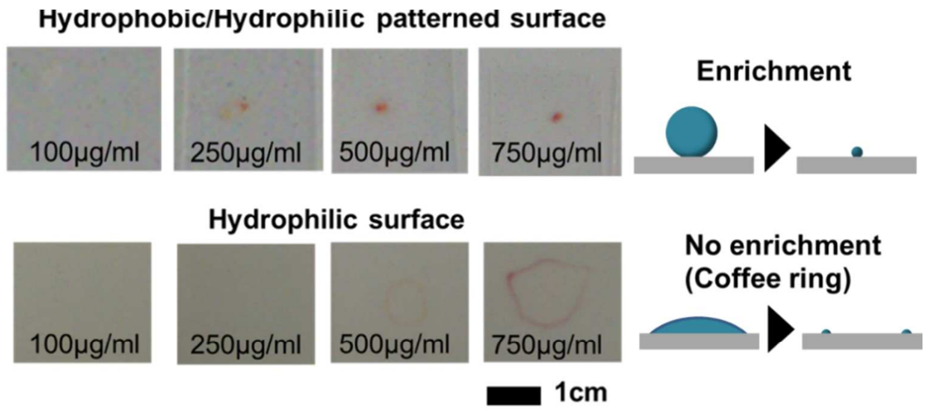

Figure S3. Enhanced color intensity by condensing enrichment effect

Superhydrophobic / hydrophilic patterned surface showed excellent detection performance due to the enrichment effect of superhydrophobic surface. On the other hands coffee ring was observed on hydrophilic surface and it was difficult to estimate the concentration especially at low concentration regions.

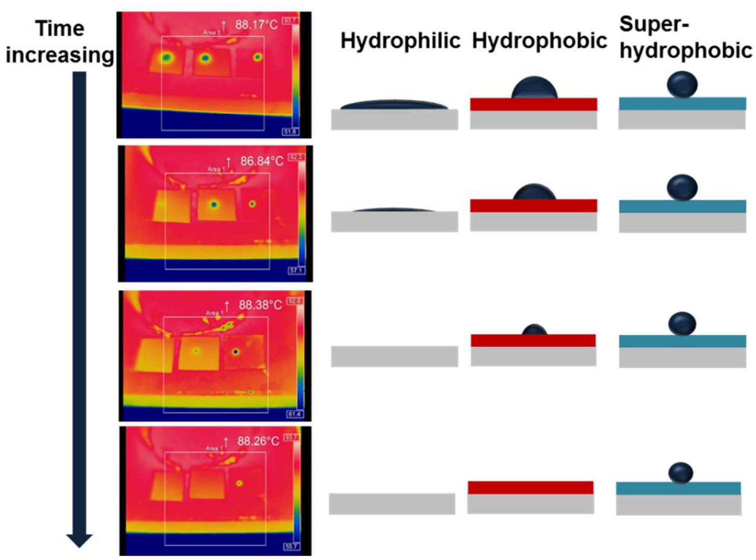

Figure S4. Difference of evaporation behavior on the various surface

During heating process at 85-90^{o}C, liquid component was rapidly evaporated in the case of hydrophilic surface. On the other hand, it took long time for removing a liquid droplet on the superhydrophobic surface.

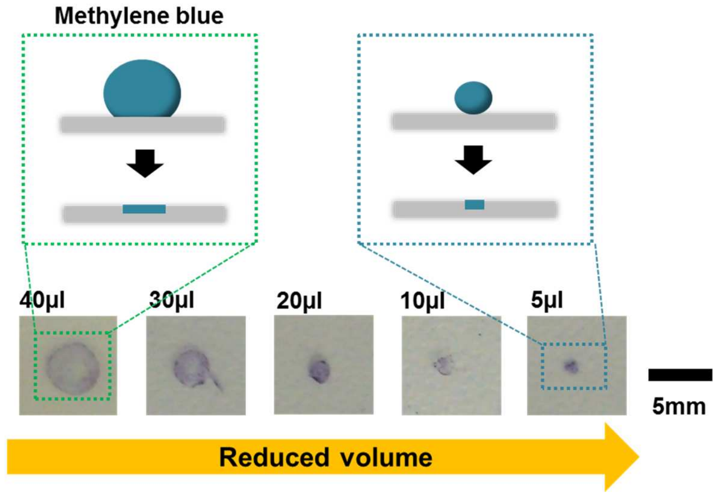

Figure S5. The effect of liquid volume for condensing enrichment effect

Various quantities of aqueous liquids colored by methylene blue were dried on the superhydrophobic / hydrophilic patterned surface and the contact area was investigated. By reducing liquid volume, the contact area was also decreased.

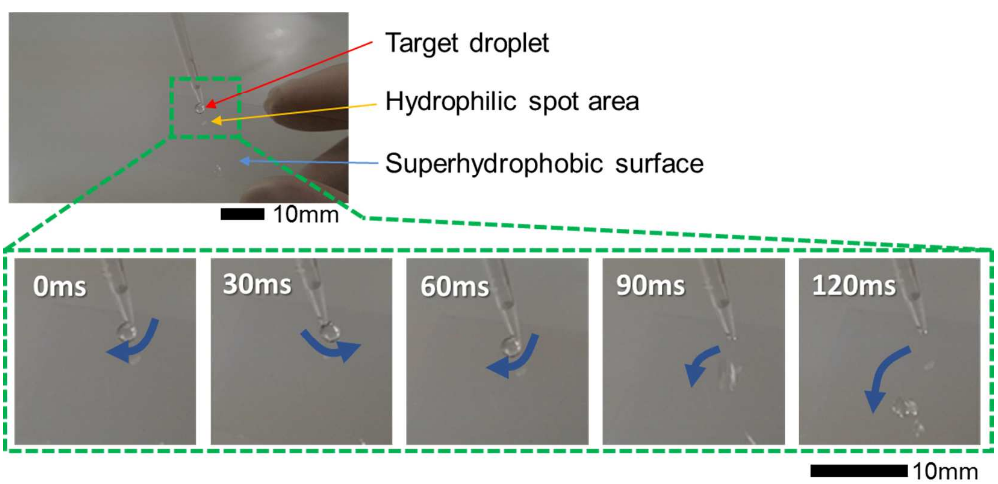

Figure S6. A trace substance detector without a flow path

It was difficult to precisely control a liquid droplet on a specific hydrophilic spot area surrounded by superhydrophobic surfaces because hand tremors caused the liquid to sway back and forth at the pipette.

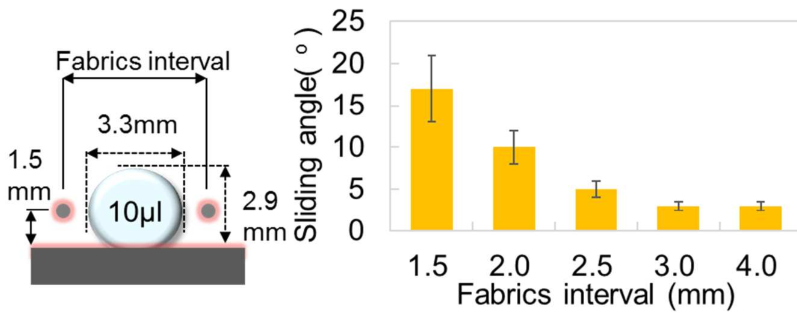

Figure S7. The effect of width of flow path

In the case of fabrics intervals with over or around the diameters of a liquid droplet, sliding behavior was not hindered by the fabrics guides due to its superhydrophobicity. On the other hand, narrow interval led to the high sliding angles.

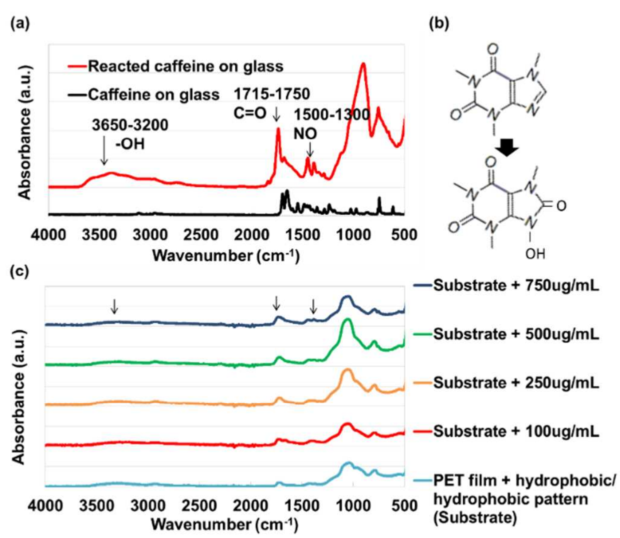

Figure S8. FT-IR spectra of caffeine after color reaction

(a) Caffeine with or without reaction of H_2O_2 / HCl on glass substrate showed the different peaks. (b) One of the chemical structure of red products cited from Ref 29. (c) Caffeine with or without reaction of H_2O_2 / HCl on a superhydrophobic / hydrophilic patterned film.

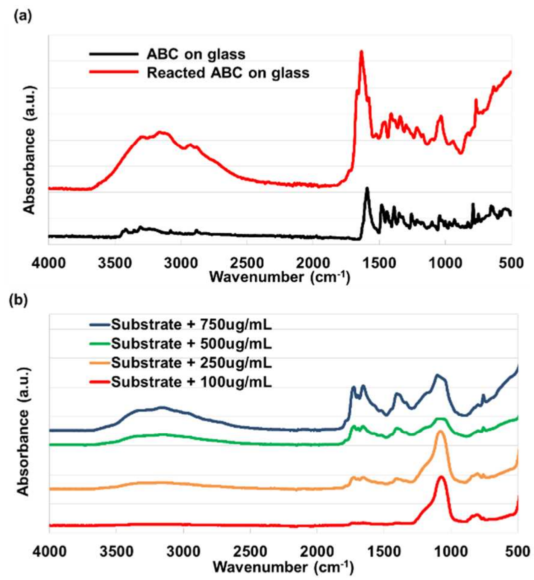

Figure S9. FT-IR spectra of abacavir (ABC)

Abacavir reacted with H_2O_2 and HCl was analyzed by FT-IR spectra. As same with the case of caffeine, the change of chemical structure was observed.

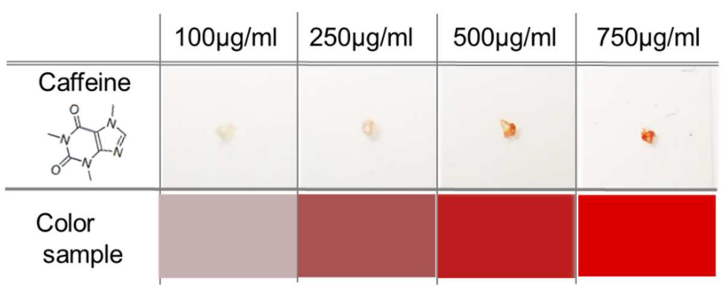

Figure S10. Color sample for estimating caffeine concentration

Redness of condensed caffeine with oxidation was gradually increased. Concentration of caffeine was easily estimated through color sample with naked eye observation.

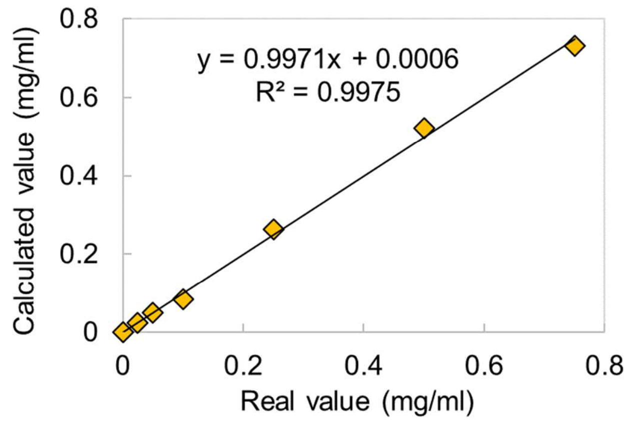

Figure S11. Calibration curve by multivariate analysis

Concentration of caffeine was calculated with the FT-IR data and optical value from Figure 7(a) by multivariate analysis. The calibration formula was as follows;

Calc. value = -0.82 + 18.05 * ① + 9.70 * ② + (-4.91) * ③ + 0.013 * ④ + 0.166 * ⑤

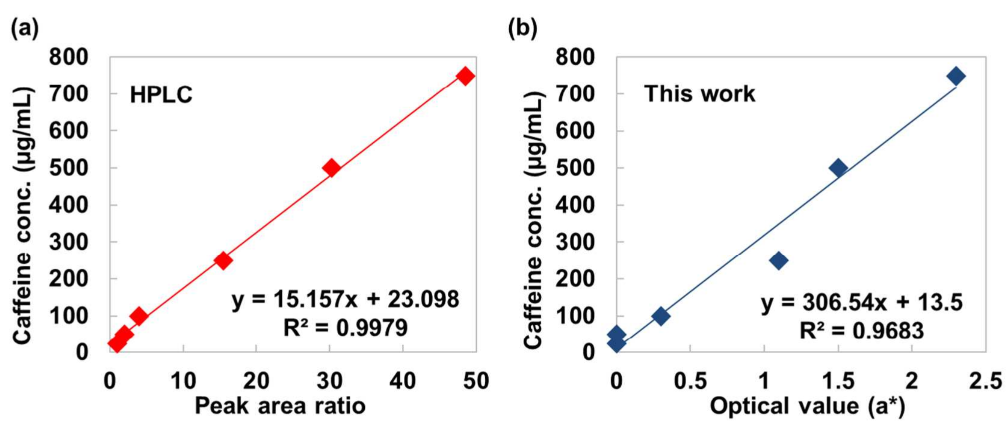

Figure S12. Comparison of high performance liquid chromatography (HPLC) and this work

A commercial HPLC was used to estimate the caffeine concentration. Although HPLC had higher reliability and a large measuring range, this work also had high reliability with an easy and convenient method. The HPLC had stationary phase: ODS, mobile phase: methanol/water=80/20, column temperature=40°C, flow speed=0.5ml/min, measurement wavelength=254nm.