Supplementary Information

Portable paper sensor for the detection of heavy metals based on light transmission-improved quantification of colorimetric assays

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Patterning hydrophobic barriers in paper by screen-printing

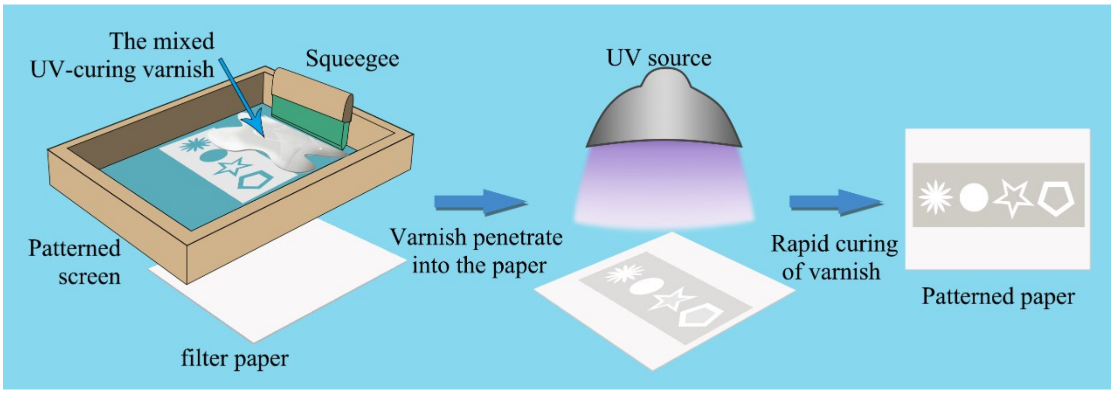

Fig. S1. The schematic of the fabrication process of paper sensor.

Patterned paper fabricated using screen-printing method

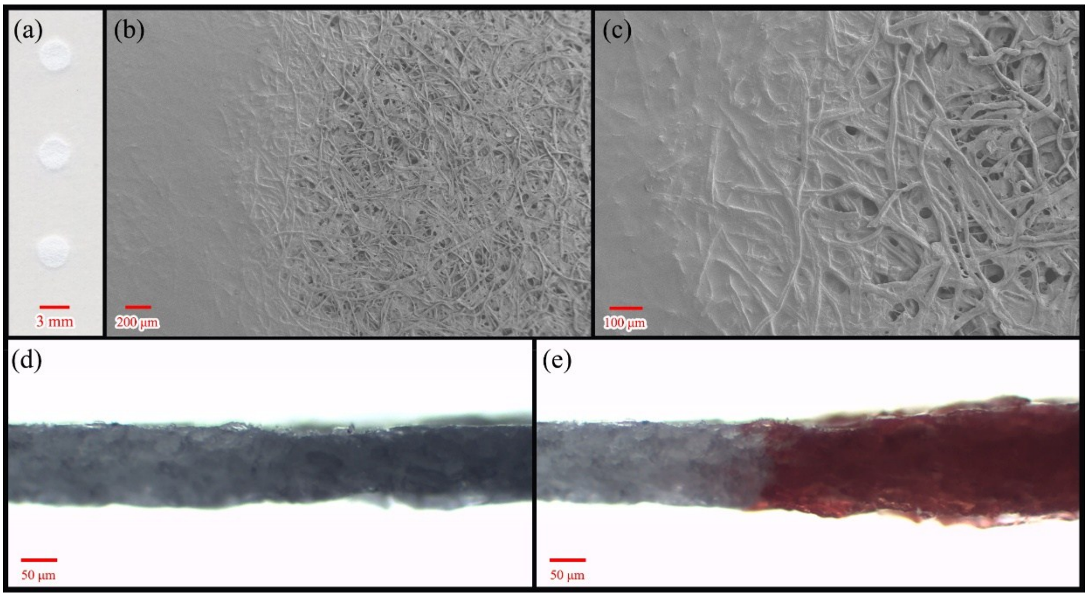

Fig. S2. (a) Patterned paper fabricated using screen-printing method with a measured width of 2967±131 μm in diameter. (b-c) Scanning electron microscope (SEM) images of the hydrophobic-hydrophilic boundary. The microscopic images of the boundary cross-section before (d) and after (e) wetted by food dye.

The optical density (OD) measured in different cases on the patterned 102 F paper

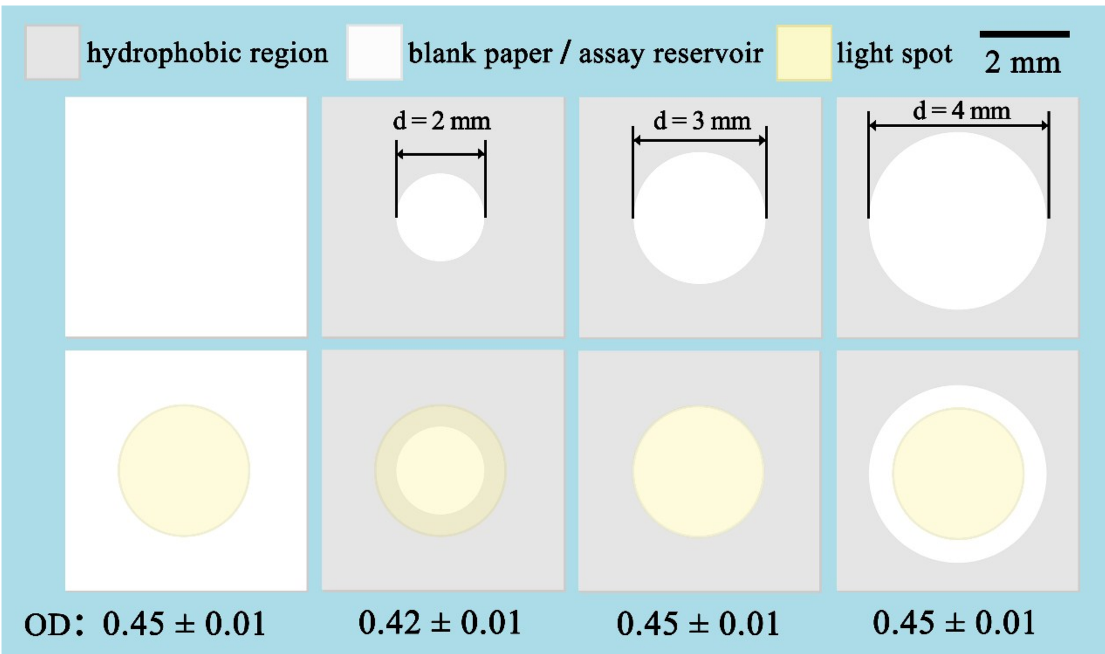

Fig. S3. The OD measured on blank paper substrate by transmission densitometer with different patterns: the unmodified paper, and the patterned paper with the designed diameter of hydrophilic reservoir of 3, 4 and 5 mm (the actual diameter of ~2 mm, ~3 mm and ~4 mm, respectively). The diameter of the light spot is 3 mm. The paper substrate is 102 F.

The diameter of wetting area versus the sample volume

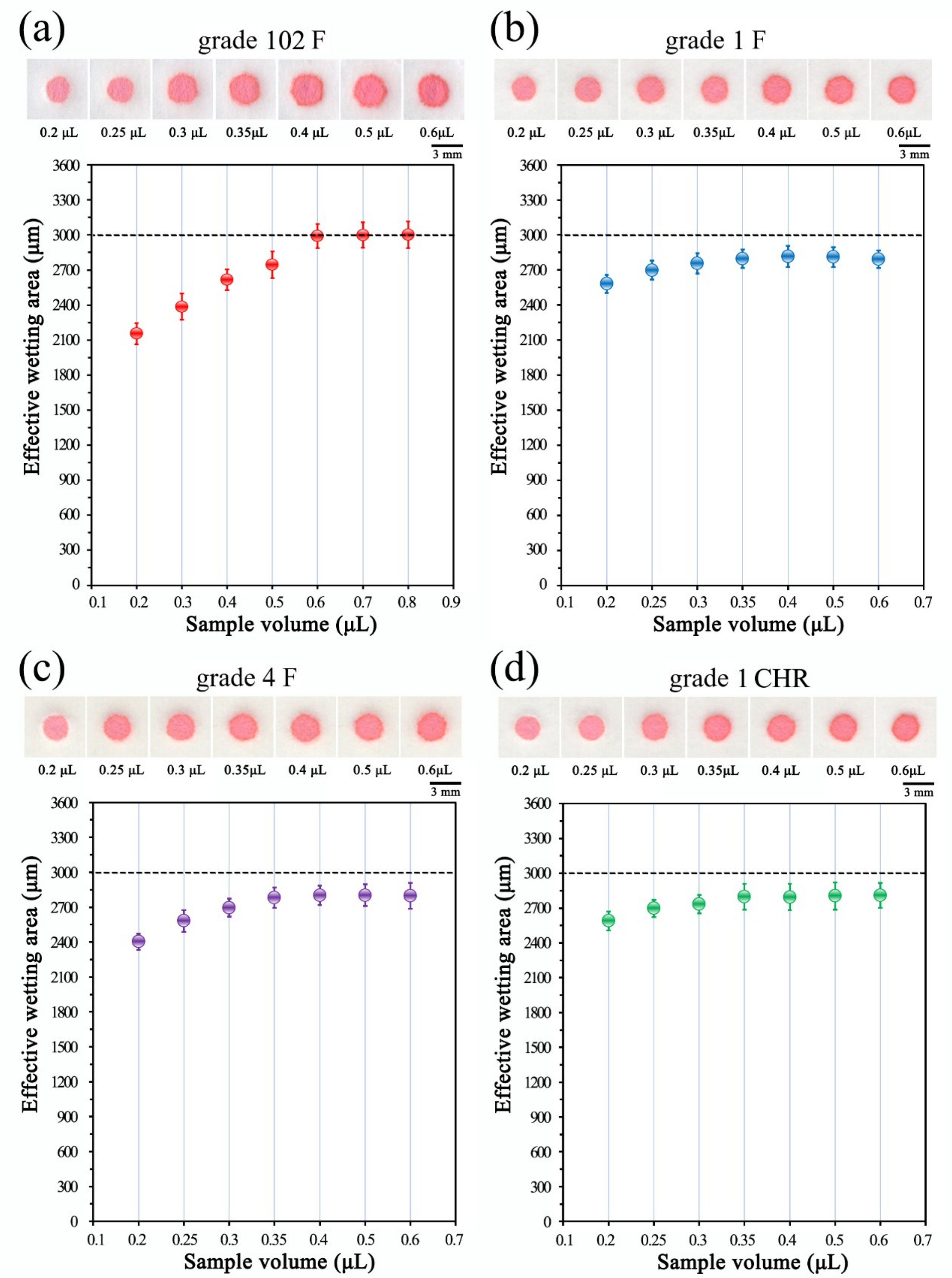

Fig. S4. The hydrophilic reservoir wetted by the food dye of different volumes and the diameter of wetting area on the pattern of the paper sensor as a function of the sample volume. (a) grade 102 F, (b) grade 1 F, (c) grade 4 F, (d) grade 1 CHR. The error bar at each point means the standard deviation from ten independent experiments.

The original optical images of the colorimetric assays

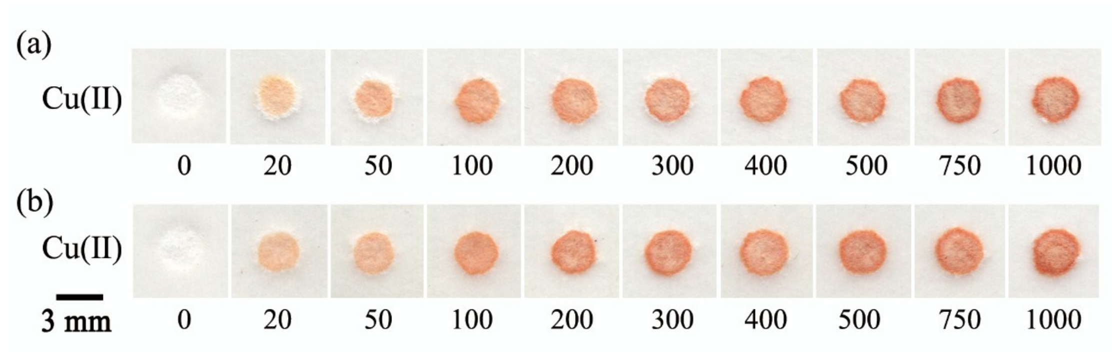

Fig. S5. The original optical images of the colorimetric assays for Cu(II) with different volumes of the sample: (a) 1.2 μL sample volume (b) 1.8 μL sample volume.

Diameter of hydrophilic reservoir of 102 F patterned paper

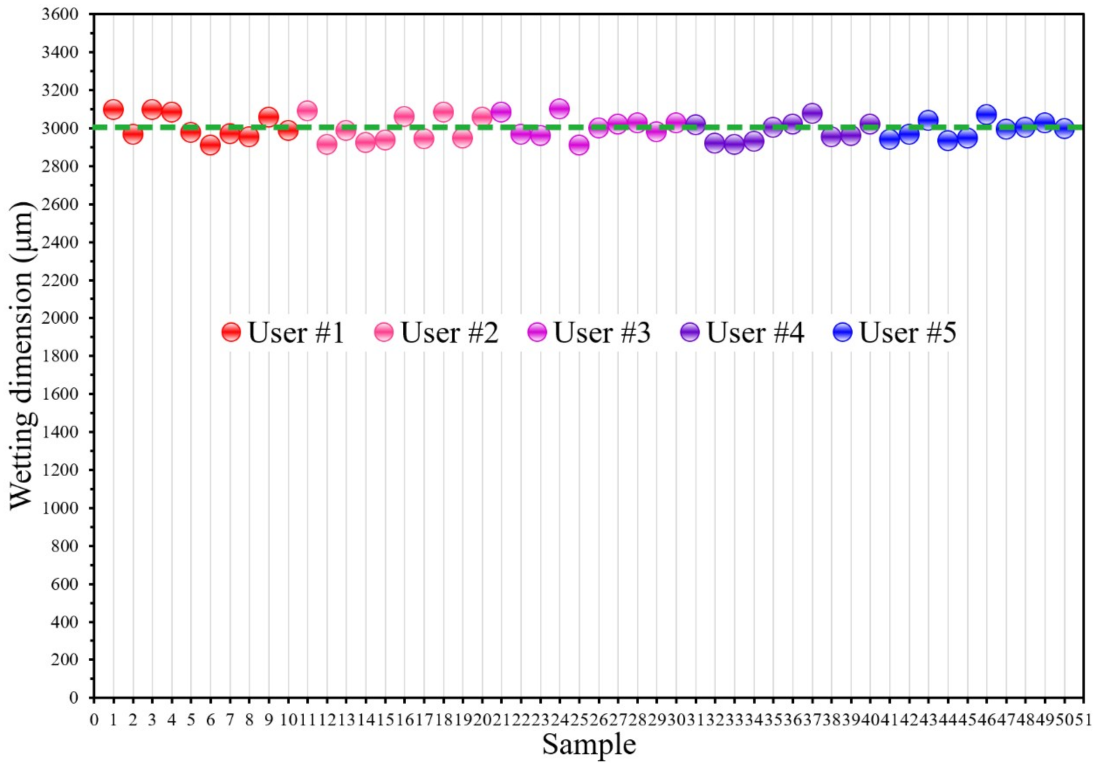

Fig. S6. The diameter of the wetted area on the hydrophilic reservoir measured from 10 samples by five users.

Selectivity and interference study in the detection of Cu(II), Fe(II)and Ni(II)

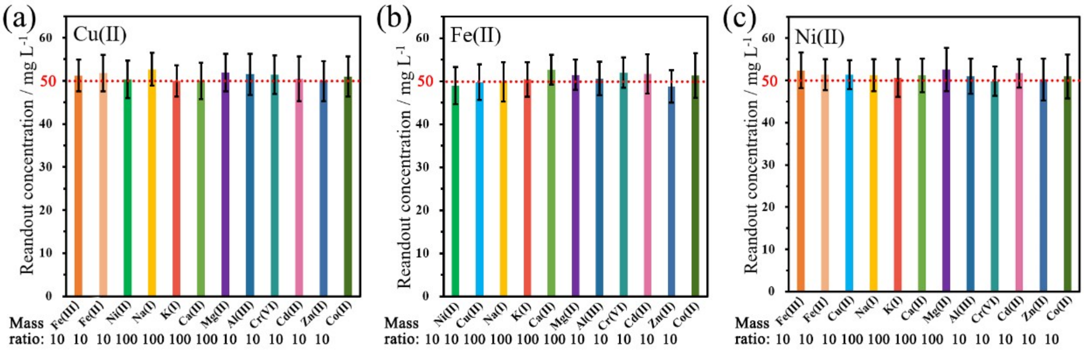

Fig. S7. The selectivity and interference study in the detection of (a) Cu(II), (b) Fe(II) and (c) Ni(II) with the fixed concentration of 50 mg/L for all the three assays.

Detection of papermaking wastewater and the sample with spiked Cu, Fe, Ni

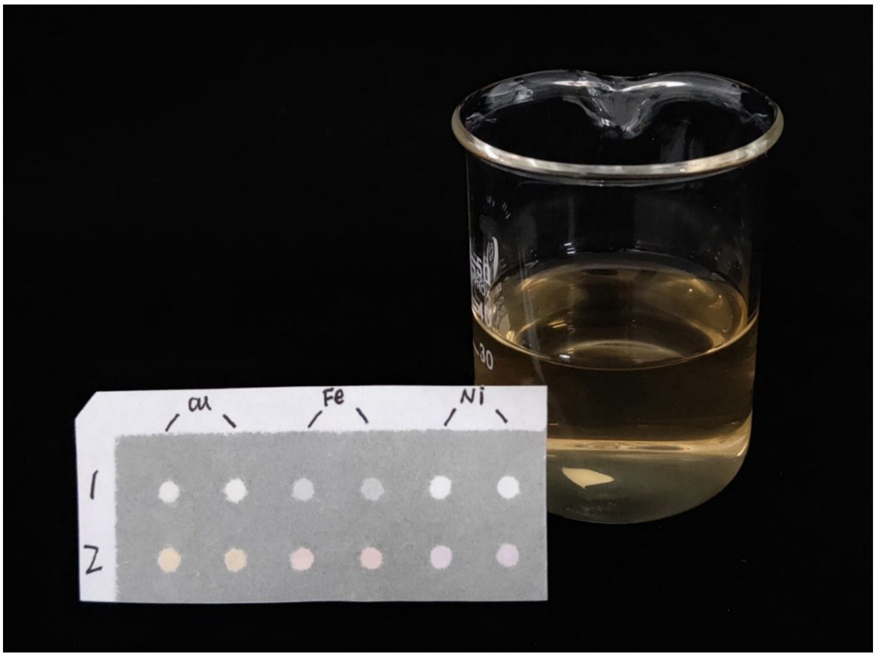

Fig. S8. Real environmental sample (the papermaking wastewater) and the detection of (1) the papermaking wastewater, (2) the papermaking wastewater with spiked Cu (30 mg/L), Fe (20 mg/L) and Ni (40 mg/L).