Supporting Information

A novel colorimetric paper sensor based on layer-by-layer assembled multilayers of surfactants for the sensitive and selective determination of total antioxidant capacity

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1. The fabrication of pattern on paper using lacquer spraying method

The spraying method with lacquer was used to fabricate the pattern on a filter paper as shown in **Figure S1**. The polyimide tape was used to create cover pattern on the paper (**Figure S1A**). Hydrophobic and hydrophilic areas were created by the spraying method. To fabricate the filter paper sensor (**Figure S1B**), the polyimide tapes that have the diameter of 15 mm were placed on the paper and then the paper was sprayed with lacquer creating the hydrophobic barrier around the polyimide tape. The number of spraying (n) was 10 for front paper and was fixed as n=5 for back view. After that, the paper was air dried. Finally, the image of hydrophobic and hydrophilic areas of the pattern on the paper were characterized using scanning electron microscopy (SEM).

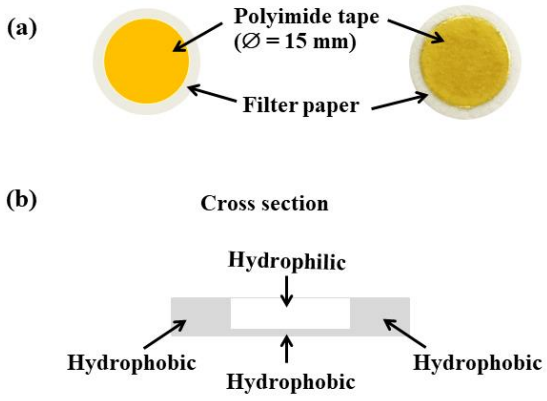


Figure S1 Schematic model of the procedure for the fabrication of the paper based devices by the lacquer spraying method (A) top view and (B) cross section view.

2. **GA assay in the paper sensor**

The quantitative data is enabled by taking a picture and applying a suitable program including Image J program based on the changing of color. To evaluate the color by Image J program, the photos of color on the paper sensor are firstly taken using a smart phone under the light controlled condition in the home-made white box (supplementary data in **Figure S2**).

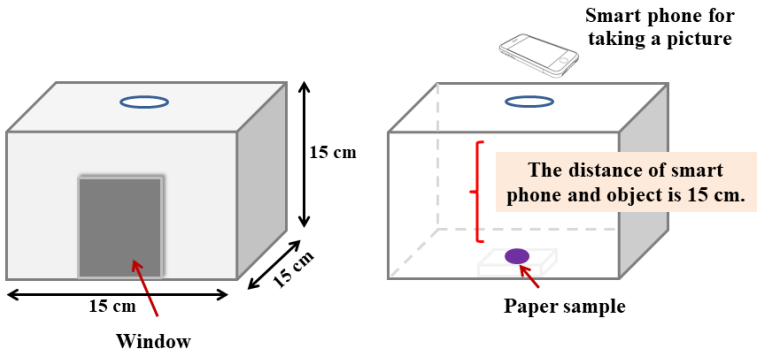


Figure S2 The home-made white box model illustrating how to capture the paper sensor from smart phone.

3. Fabrication of paper sensor based on filter paper type

In this work, the effect of lacquer type was studied including paint lacquer and glossy spray lacquer. For paint lacquer, it was found that the diffusion of lacquer under the polyimide tape could not be controlled. While glossy spray lacquer, the hydrophobic and hydrophilic areas could be generated on the paper, and the uniformity of pattern on paper was clearly observed. Therefore, the glossy spray lacquer was chosen to fabricate the PADs.

To further study, the filter paper types which provided the particle retention efficiency, were investigated with different particle size (μm). The Whatman filter paper No. 42 (2.5 μm porosity), No. 1 (11 μm porosity) and No. 4 (20-25 μm porosity) were investigated (**Figure S3**). The results indicated that the Whatman filter paper No. 4 gave the best results when compared with the other papers because it has larger porosity that made easily and rapidly infiltrated of lacquer on the fiber of filter paper No. 4. Thus, the Whatman filter paper No. 4 was selected to fabricate paper sensor.

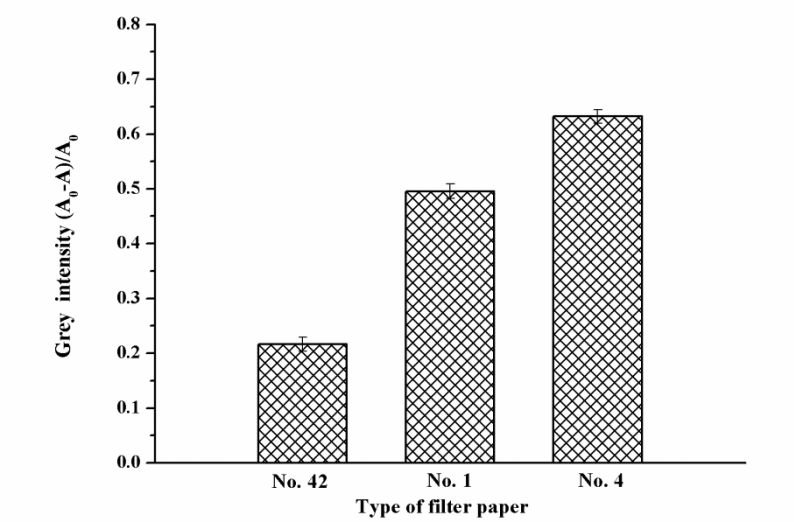
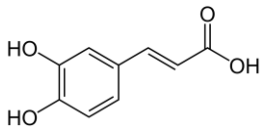
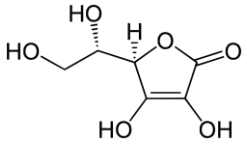
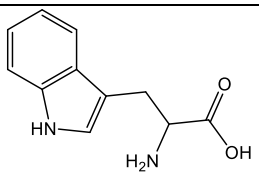
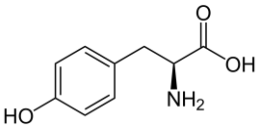
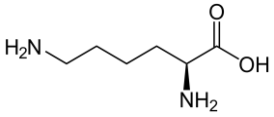


Figure S3 The effect of different filter paper for the colorimetric sensor between Fe^{3+}/$(TBABr/SDS)_3$/PAD sensor and 6.50 mM of GA.

Table S1 Structure of interferences.

Interference	Structure
Caffeic acid	
Ascorbic acid	
L-Tryptophan	
L-Tyrosine	
L-Lysine	
L-cysteine