Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information for

Cost-Effective and Sensitive Anthocyanin-Based Paper Sensors for Rapid Ammonia Detection in Aqueous Solutions

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Reagent Preparation:

Reagents were prepared as per Phenate Method (4500-NH_3 F) with minor modifications.[1]

Ammonium stock and standard solutions. Ammonium chloride (NH_4Cl) powder was dried in an oven at 100 °C for one hour before use. Dried NH_4Cl (3.819 g) was dissolved in 1,000 ml of deionized water to prepare the stock solution with a concentration of 1,000 mg NH_3-N/L. The standard solutions in the range of 0.01 to 20 mg NH_3-N/L were prepared by the serial dilution of the stock solution before the analysis.

Phenol solution: This solution was prepared by adding phenol (11.877 g) into a 100 ml volumetric flask, followed by adding ethyl alcohol (95%) to reach the final volume.

Sodium nitroprusside solution: The catalyst solution was prepared by dissolving sodium nitroprusside (0.5688 g) in 100 ml of deionized water. This solution was stored in a screw-capped amber color bottle at 4 °C, and it can be used for up to one month.

Alkaline citrate solution: This solution was prepared by adding sodium citrate dihydrate (227.93 g) and sodium hydroxide (10 g) in 1,000 ml of deionized water.

Oxidizing solution: The oxidizing solution is a mixture of alkaline citrate and sodium hypochlorite (5%) solutions in 4:1 ratio; 100 ml of alkaline citrate solution was mixed with 25 ml of sodium hypochlorite solution. This solution should be prepared daily before use.

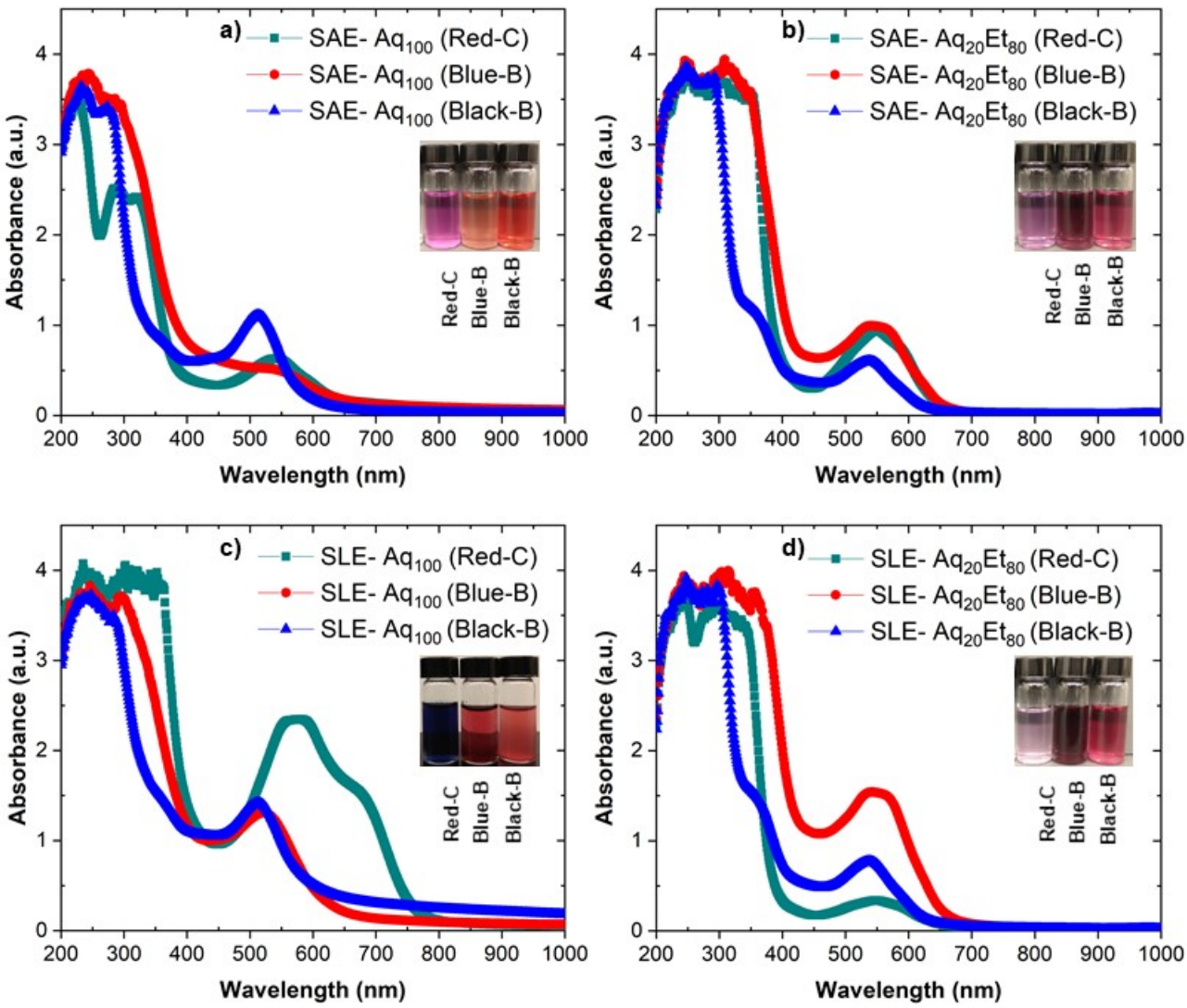

Figure S1: UV-Vis spectra of anthocyanin extracted from blackberry (Black-B), blueberry (Blue-B), and red cabbage (Red-C): (a) and (b) sonication assisted extraction (SAE) in deionized water (Aq_{100}) and 80% aqueous ethanolic solution ($Aq_{20}Et_{80}$). (c) and (d) solid-liquid extraction (SLE) in deionized water (Aq_{100}) and 80% aqueous ethanolic solution ($Aq_{20}Et_{80}$). Photos of vials containing anthocyanin extracts are shown as insets.

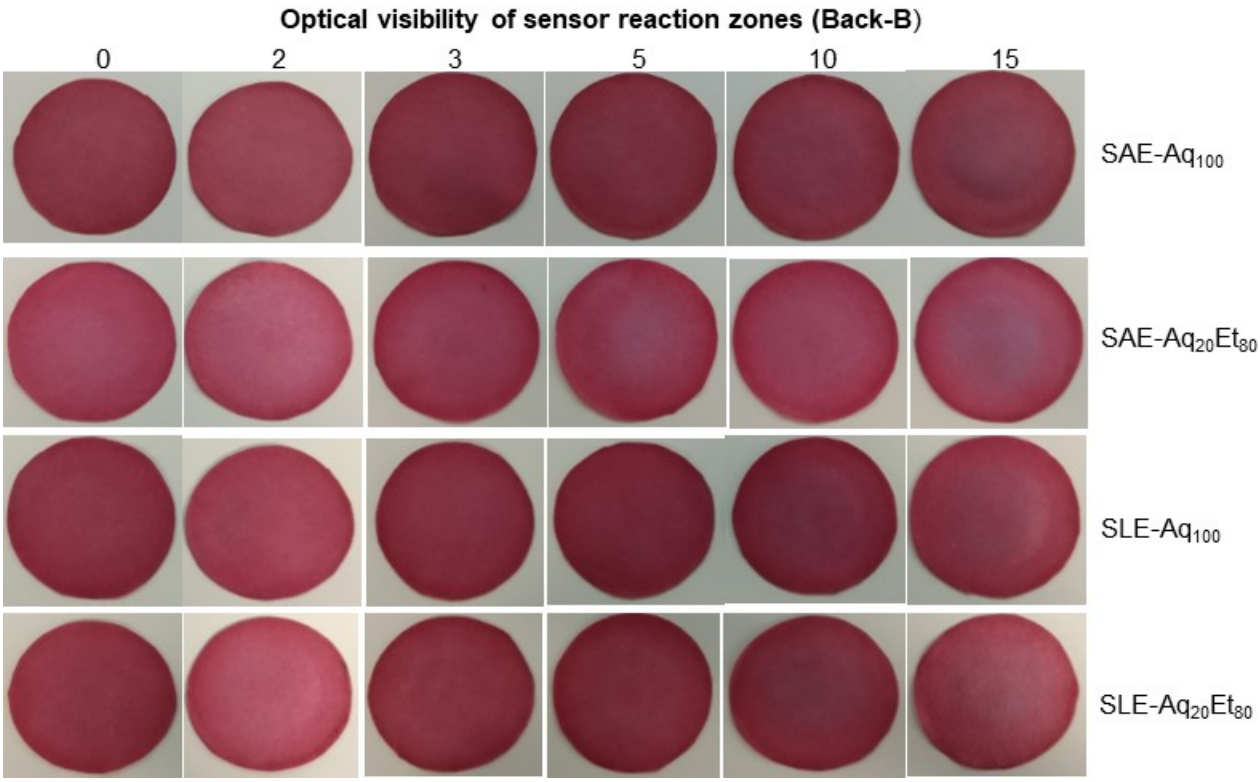

Figure S2: Photos of Black-B anthocyanin-based paper sensors after exposure to different ammonia concentrations (2, 3, 5, 10, and 15 NH_3-N/L). 0 represents the blank sample.

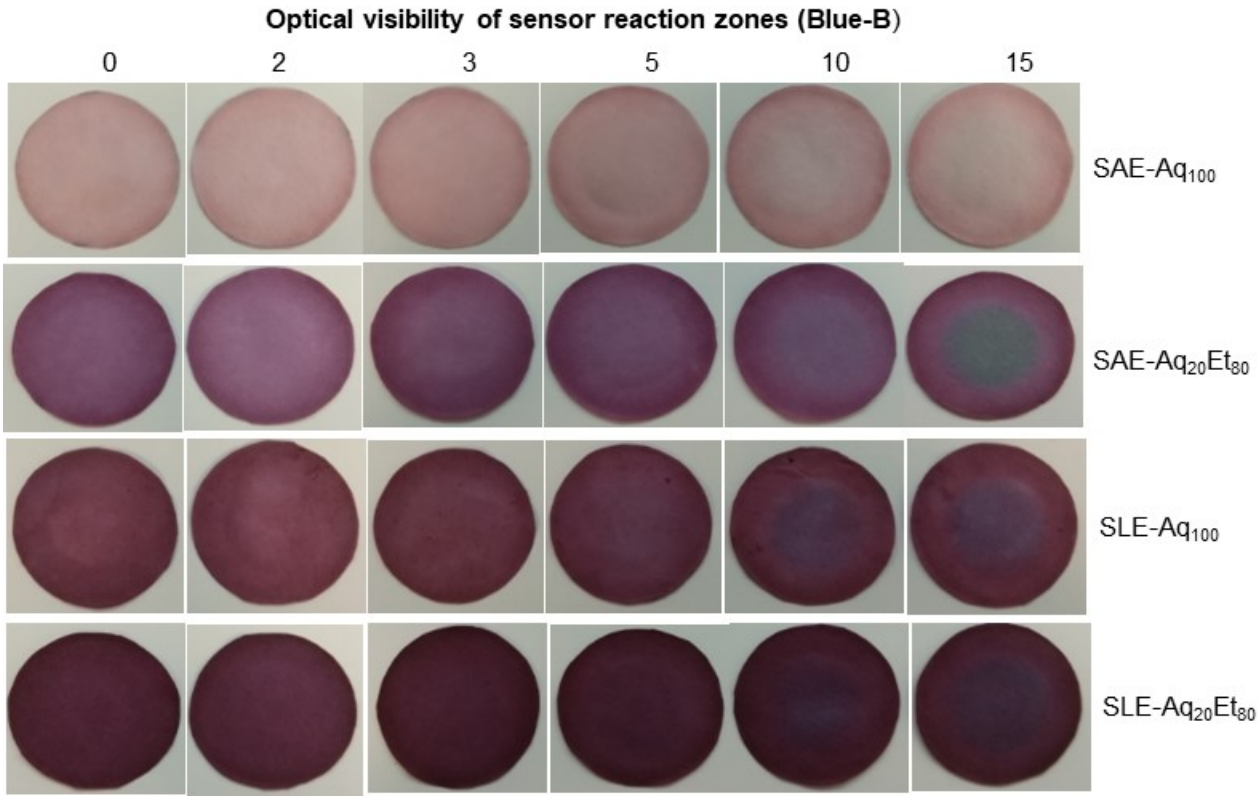

Figure S3: Photos of Blue-B anthocyanin-based paper sensors after exposure to different ammonia concentrations (2, 3, 5, 10, and 15 NH_3-N/L). 0 represents the blank sample.

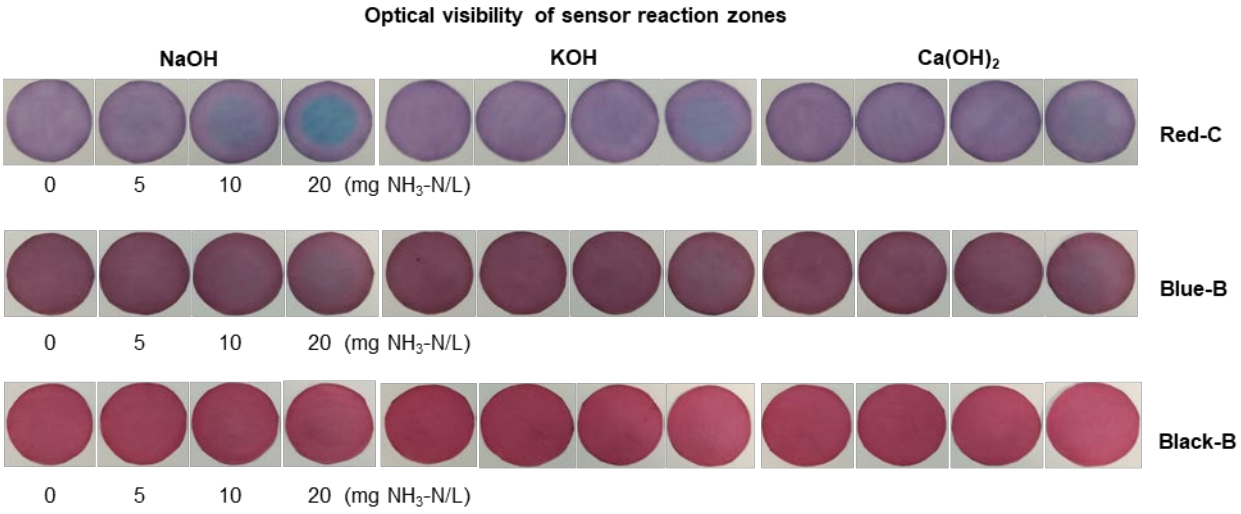

Figure S4: Photos of sensors fabricated from different sources (Red-C, Blue-B, and Black-B) after exposure to the released ammonia gas, following alkalinization with NaOH, KOH, and $Ca(OH)_2$ at 5, 10 and 20 mg NH_3-N/L (0 represents the blank sample).

Reference:

(1) Baird, R. B.; Rice, C. E. W.; Eaton, A. D. Standard Methods for the Examination of Water and Wastewater, 23rd ed.; Water Environment Federation, American Public Health Association, American Water Works Association, 2017.