ELECTRONIC SUPPLEMENTARY INFORMATION

Development of achromatic - chromatic colorimetric sensors for on-off type recognition of analytes

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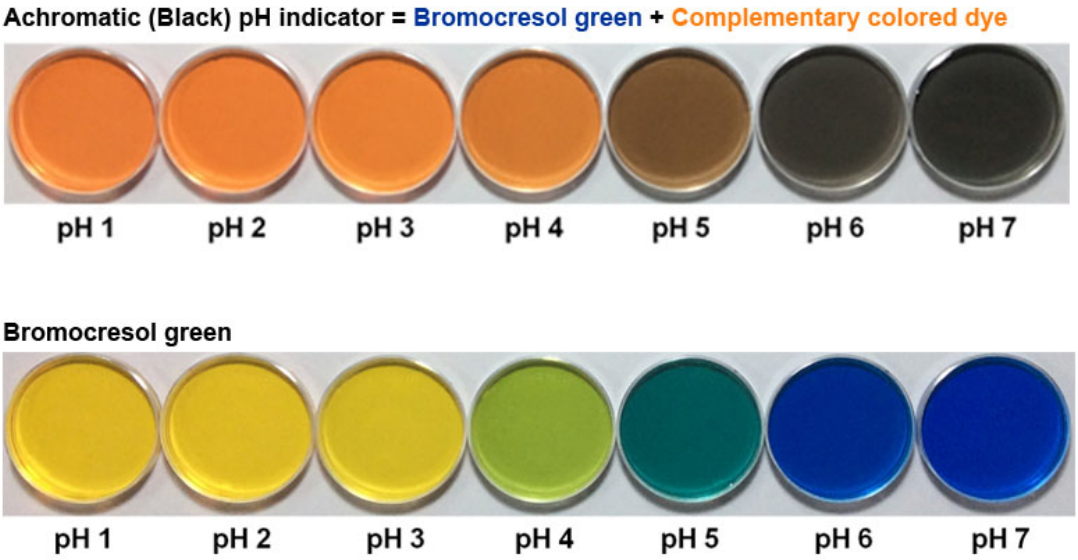

Fig. S1 Color change of the achromatic (Black) pH indicator and general bromocresol green at different pH (from pH 7 to pH 1).

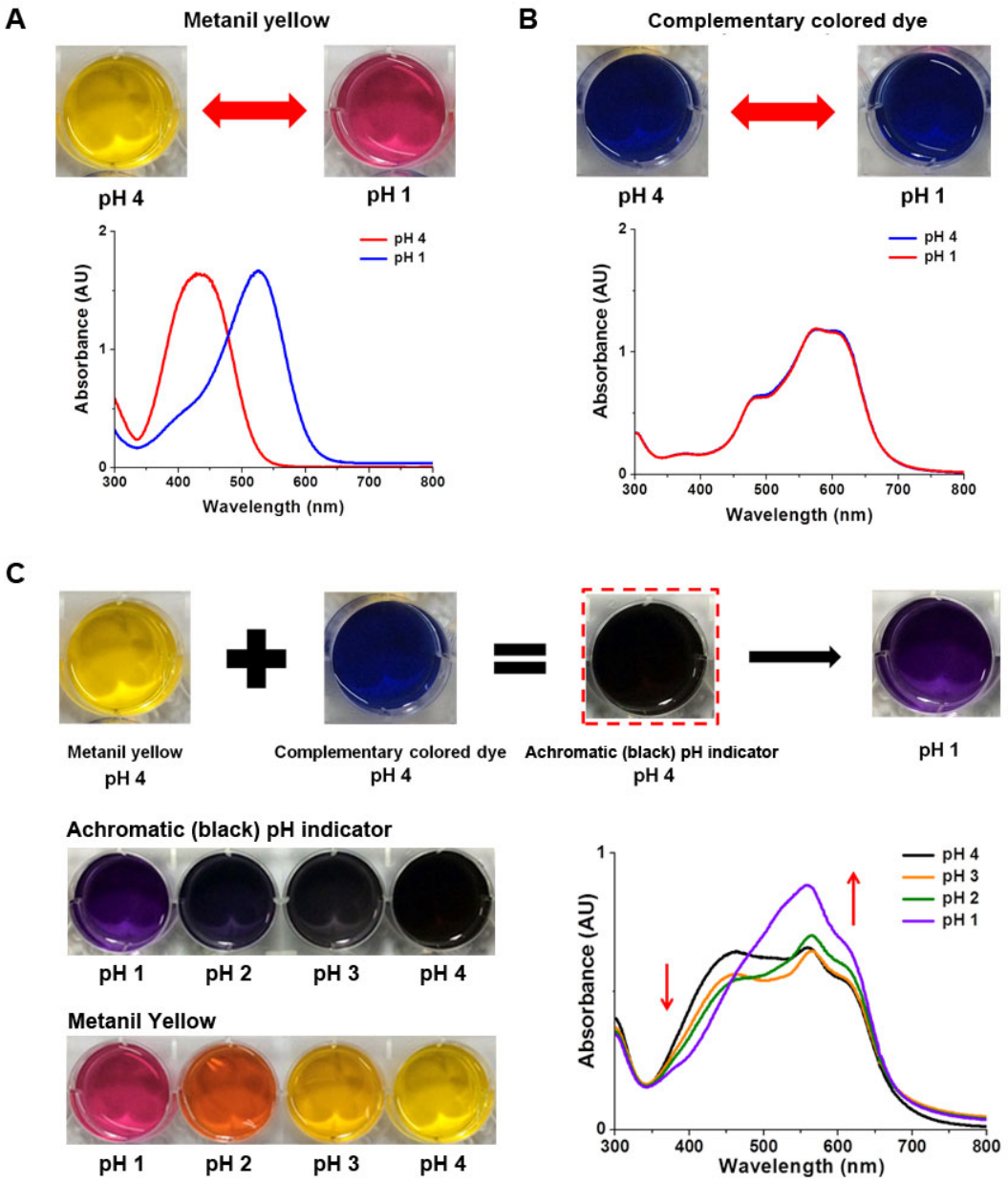

Fig. S2 (A, B) Color changes of metanil yellow, and its complementary blue-violet colored dye with different pH (pH 4, and pH 1). In the case of metanil yellow, its color change from yellow-orange (dark pink) to dark pink (yellow-orange) and red (blue) shift of absorbance depending on the pH. However, there is no color change of blue-violet complementary dye, and no shift of absorbance. (C) The achromatic (black) pH indicator at pH 4 is obtained by mixing metanil yellow and blue-violet complementary dye. At pH 4, achromatic (black) pH indicator has black color and absorb all visible light (400 - 700 nm). However, as the pH decreases, its color changes from black to red-violet, and increase the absorbance at 550 - 595 nm (yellow-green range).

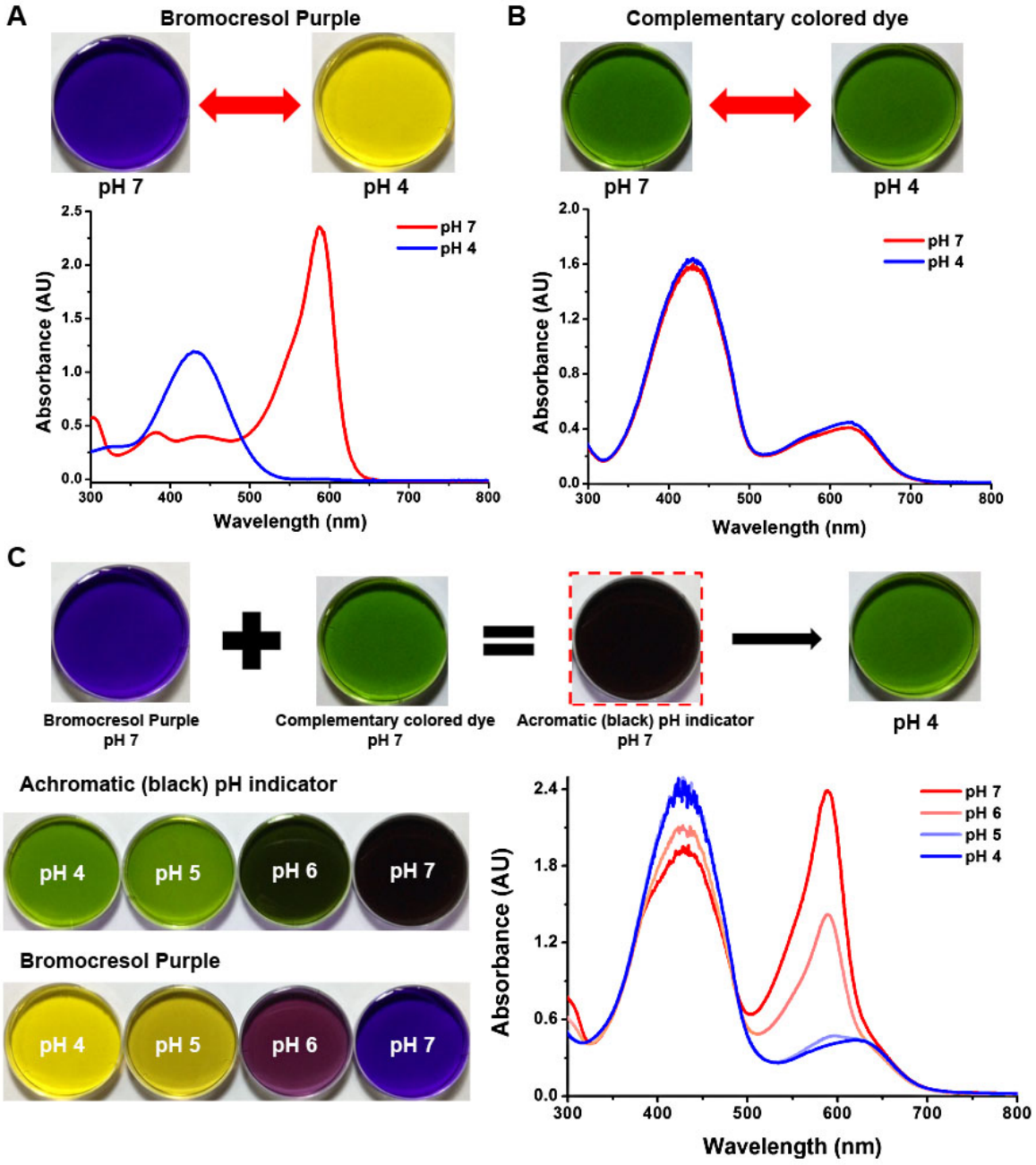

Fig. S3 (A, B) Color changes of the bromocresol purple (BCP) and its complementary green colored dye with different pH (pH 7 and pH 4). In the case of BCP, its color changes from purple (yellow) to yellow (purple) and blue (red) shift of absorbance depending on the pH. However, there is no color change of green complementary dye and no shift of absorbance. (C) The achromatic (black) pH indicator is obtained by mixing BCP and green complementary dye. At pH 7, achromatic (black) pH indicator has black color and absorbs specific region of visible light (400 - 700 nm). However, as the pH decreases, its color changes from black to green, and increase the absorbance at 400 - 480 nm (blue-violet range) and decrease the absorbance at 560 - 620 nm (dark yellow-green range).

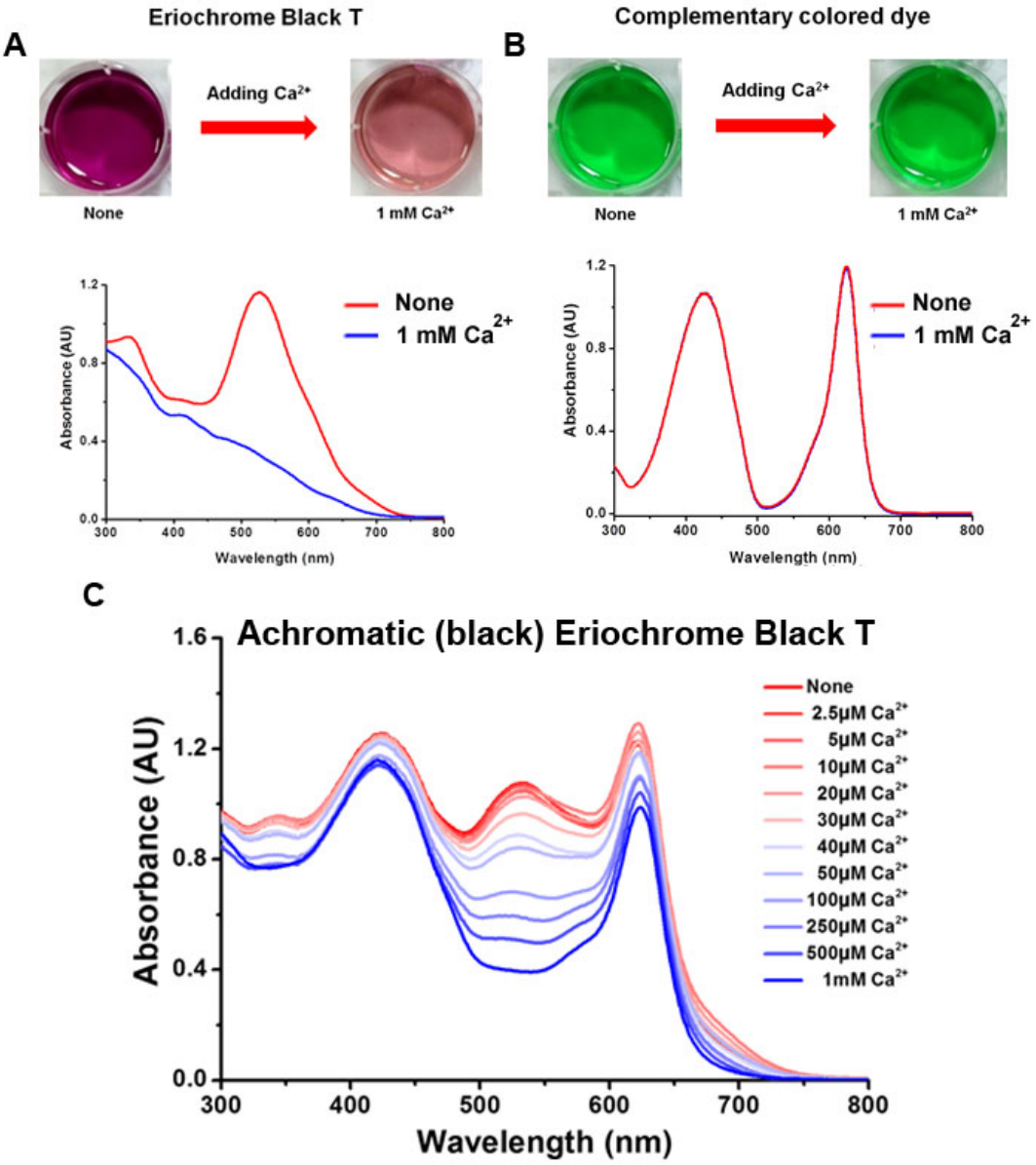

Fig. S4 (A) Color change of the Eriochrome Black T (EBT) from red-violet to light pink in the presence of Ca^{2+}. In the absence of Ca^{2+}, EBT has maximum absorbance peak at 526 nm. However, the absorbance of EBT at 496 - 570 nm (green range) decreases by adding 1 mM of Ca^{2+}. (B) There is no color change of light green complementary dye in the presence of Ca^{2+}. It can be also observed that there is no shift of absorbance of light green complementary dye in the presence of Ca^{2+}. (C) Absorbance spectra of the achromatic (black) EBT depending on the Ca^{2+} concentration. As the concentration of Ca^{2+} increases, the absorbance at green range (496 - 570 nm) decreases.

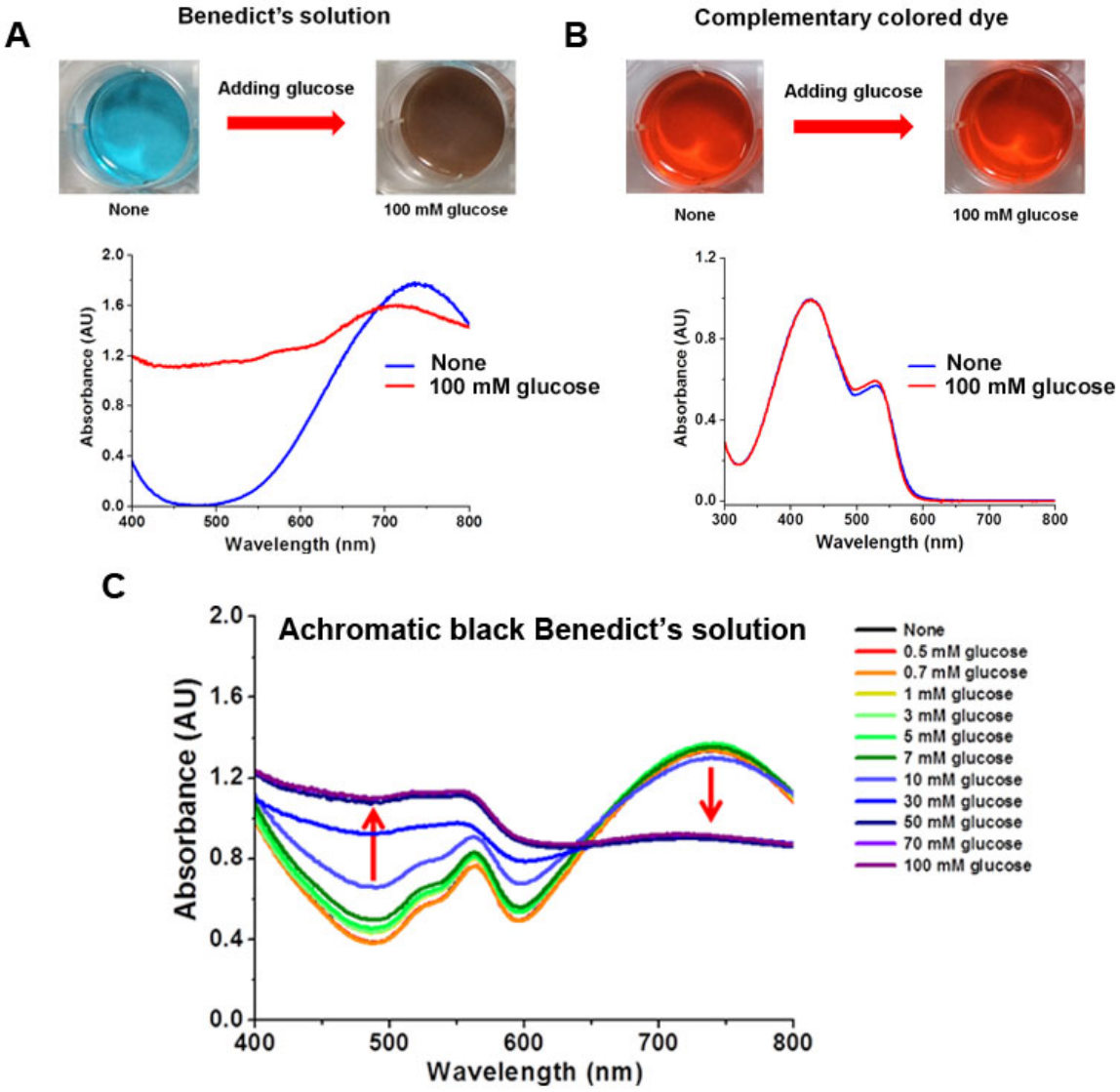

Fig. S5 (A, B) Color changes of the Benedict's solution and its complementary colored dye in the presence of glucose. In the case of Benedict's solution, its color changes from blue-green to brown, and a increase of absorbance at 480 - 530 nm (blue-green range). However, red-orange complementary dye do not change its color, and shows no shift of absorbance peak in the presence of glucose. (C) Absorbance spectra of the achromatic (black) Benedict's solution with different concentrations of glucose. As the concentration of glucose increases, the absorbance at 480 - 530 nm (blue-green range) increases, while another absorbance at 650 - 730 nm (red-orange range) decreases.