Supporting information for

Paper-based colorimetric chemosensor for highly sensitive and selective detection of Cd^{2+} in water and food samples

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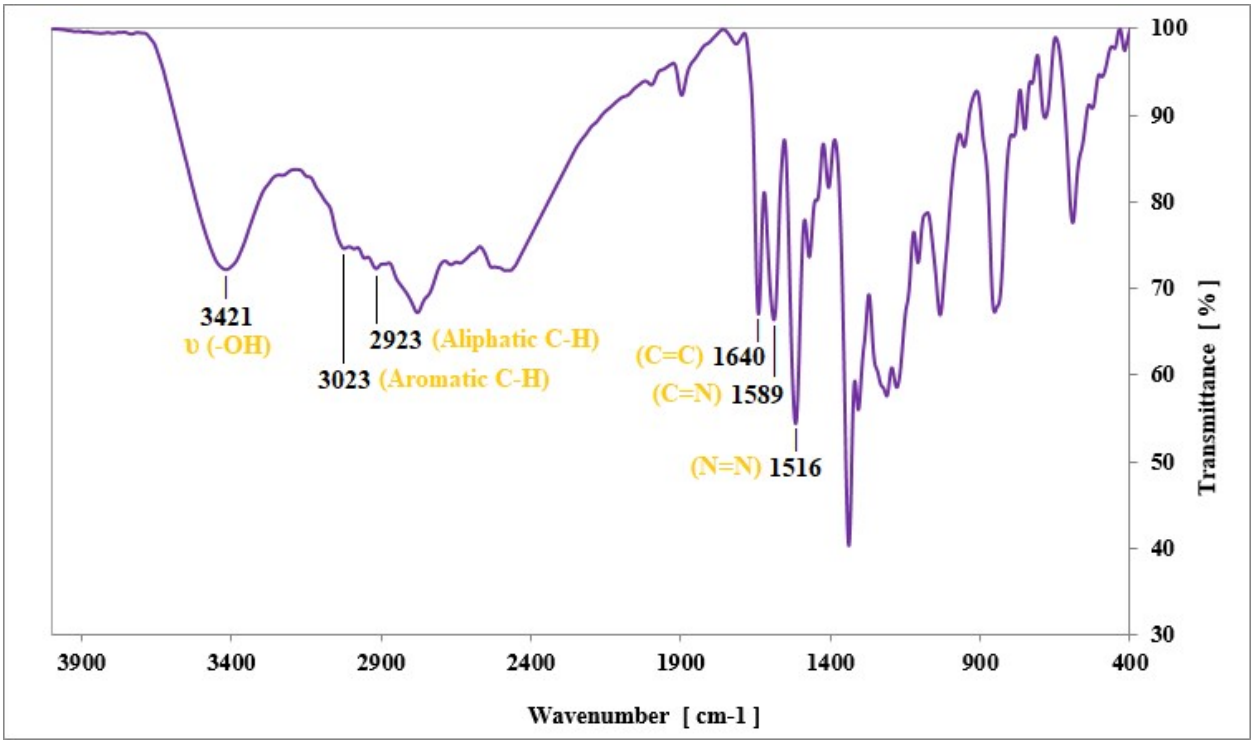


Figure S1. FT-IR spectra of the NAAMQ.

Solvent effects on the sensing performance of the NAAMQ: The effects of different solvents on the free NAAMQ and NAAMQ-Cd^{2+} were investigated. The maximum absorbance of the free NAAMQ in DMSO, acetonitrile, methanol, ethanol, and DMF at λ_{max} of 421, 408, 429, 429, and 421 nm were equal to 1.25, 0.66, 0.87, 0.96, and 1.13, respectively. The maximum absorbance of the NAAMQ-Cd^{2+} complex in DMSO, acetonitrile, methanol, ethanol, and DMF at λ_{max} of 545 nm were equal to 2.31, 1.93, 1.28, 1.50, and 2.12, respectively. Figure S3 (Supplementary data) shows UV-Vis spectra and color changes of the free NAAMQ and NAAMQ-Cd^{2+} in various solvents at pH 7.0. According to the results, detect Cd^{2+} cations by the NAAMQ in acetonitrile solvent was correlated with higher absorption intensity. Therefore, in colorimetric tests, the acetonitrile was used as the optimum solvent for the evaluation of the NAAMQ performance. Furthermore, according to Figure S4 (Supplementary data), using different ratios of acetonitrile/H_2O (v/v) were leaded to assess the effect of solvent ratios on the sensing behavior of the NAAMQ for the detect Cd^{2+} cations. According to the results, the detect Cd^{2+} cations in acetonitrile/H_2O solvent prepared with the ratios of 10:0, 9:1, 8:2, 7:3, 6:4, 5:5, and 4:6 was associated with a clear color change and higher absorption intensity in comparison with the other solvent ratios. Therefore, in all of the colorimetric measurements, the acetonitrile/H_2O ratio of 6:4 (v/v) was chosen for the studies.

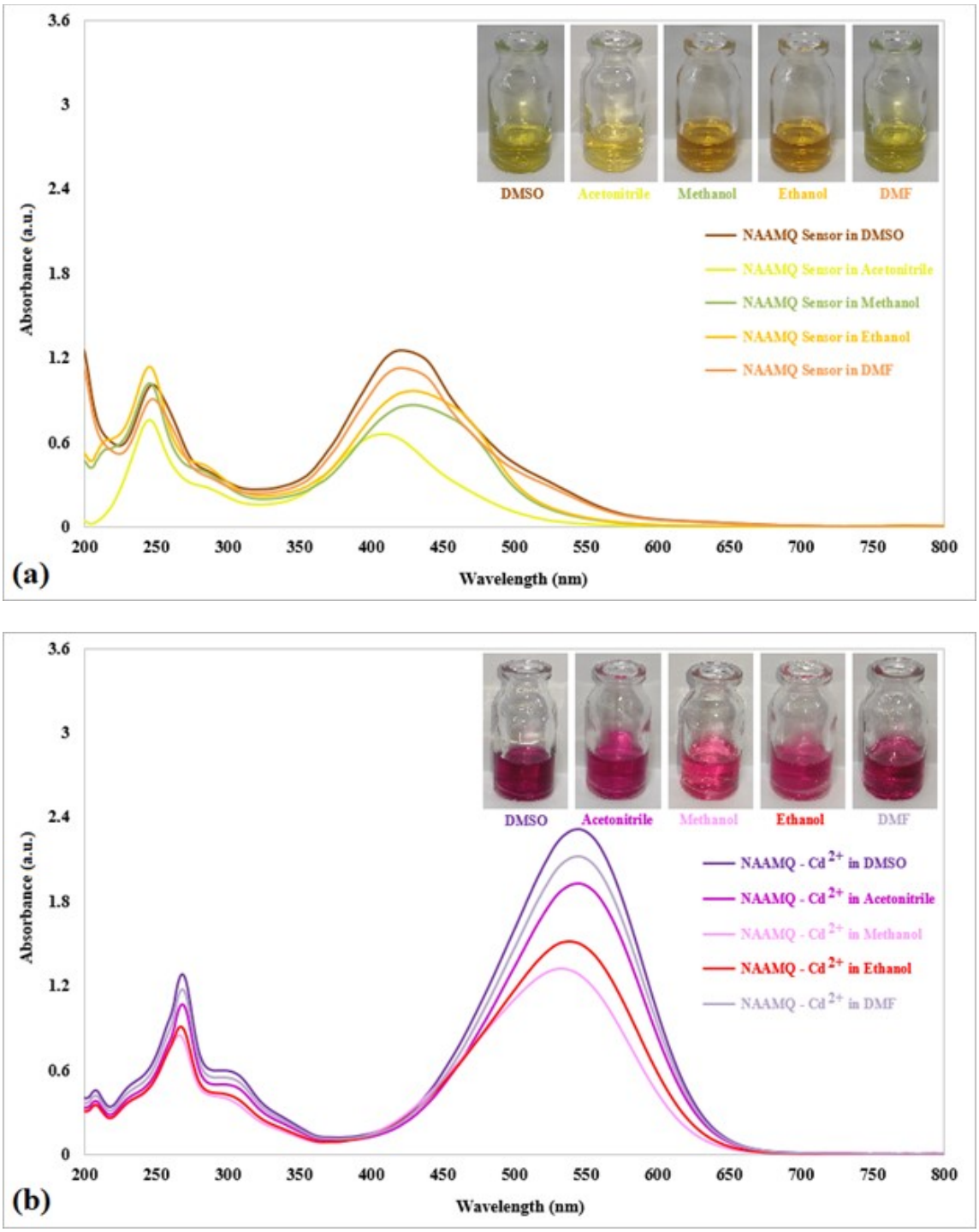
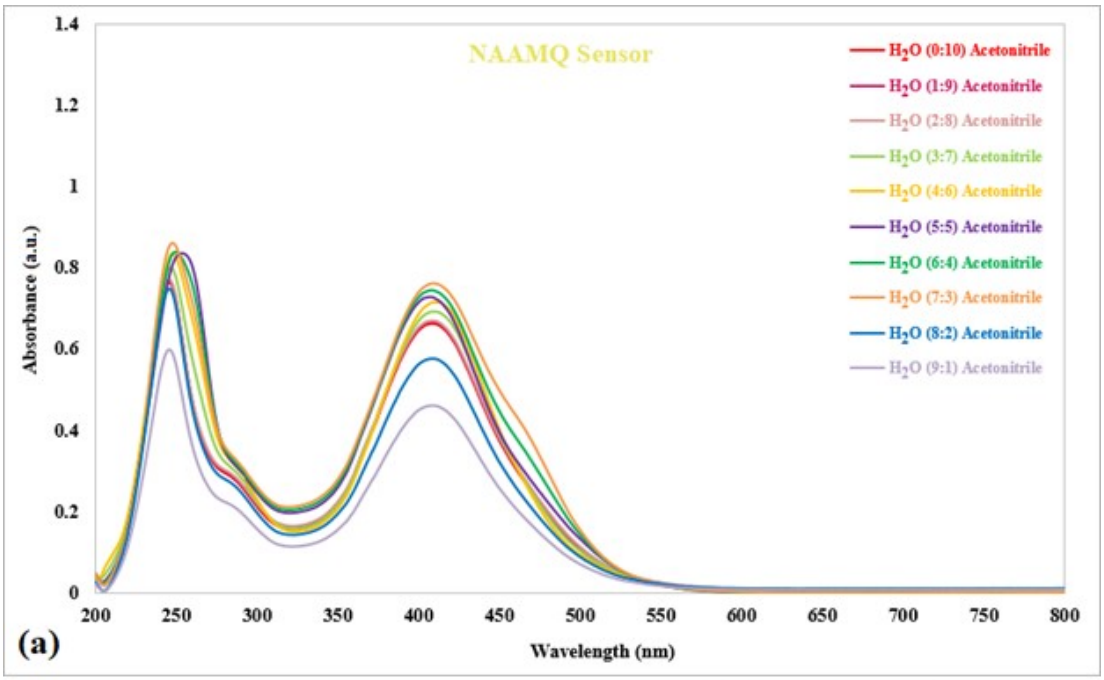


Figure S2. UV-Vis absorption spectrum and color changes of the free NAAMQ (a) and NAAMQ-Cd^{2+} (b) in different solvents at pH of 7.0. (The final concentration of the sensor and Cd^{2+}, 79 and 25 μM, respectively)


NAAMQ Sensor
H2O (0:10) Acetonitrile
H2O (1:9) Acetonitrile
H2O (2:8) Acetonitrile
H2O (3:7) Acetonitrile
H2O (4:6) Acetonitrile
H2O (5:5) Acetonitrile
H2O (6:4) Acetonitrile
H2O (7:3) Acetonitrile
H2O (8:2) Acetonitrile
H2O (9:1) Acetonitrile
Absorbance (a.u.)
Wavelength (nm)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
200
250
300
350
400
450
500
550
600
650
700
750
800
(a)


NAAMQ Sensor

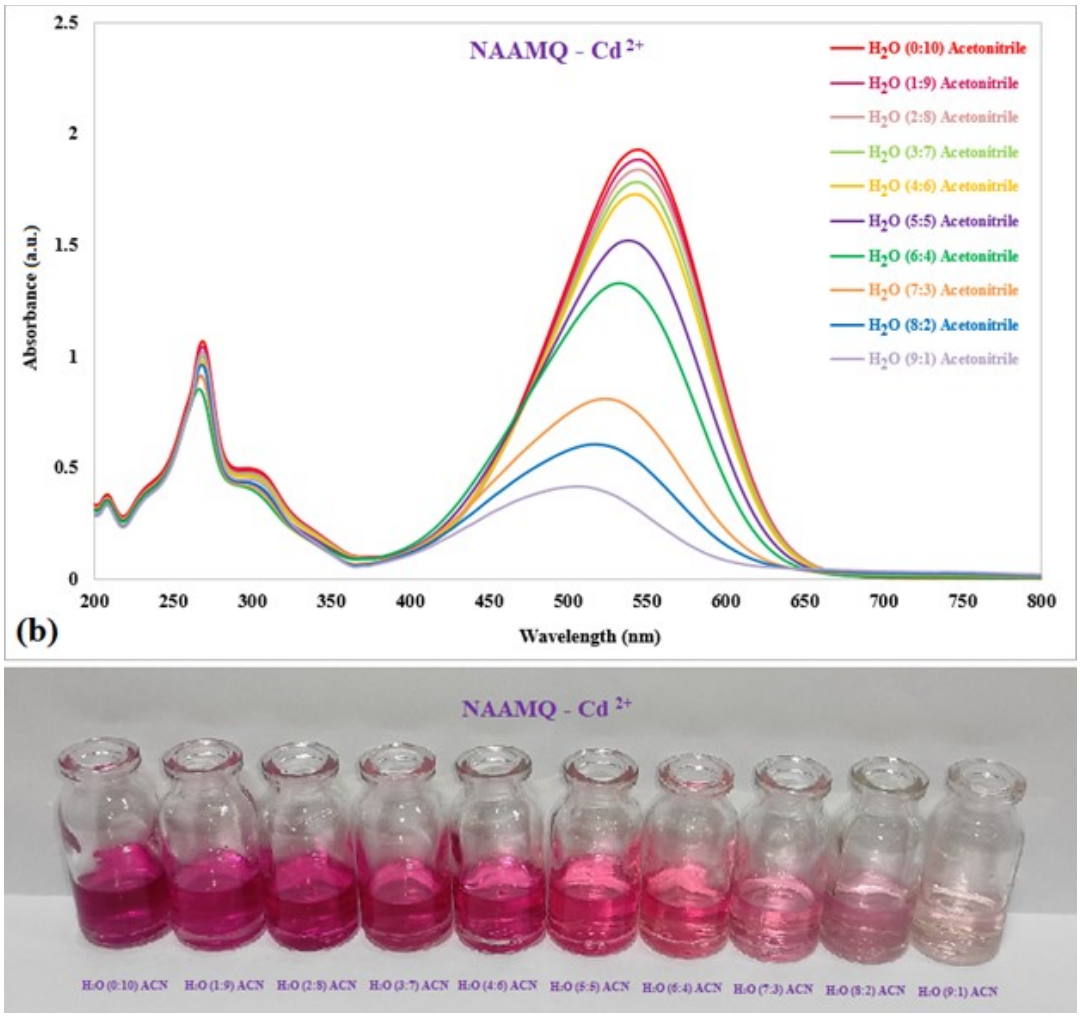


Figure S3. UV-Vis absorption spectrum and color changes of the free NAAMQ (a) and NAAMQ-Cd^{2+} (b) in mixed H_2O/acetonitrile (v/v) at pH of 7.0. (The final concentration of the sensor and Cd^{2+}, 79 and 25 μM, respectively)

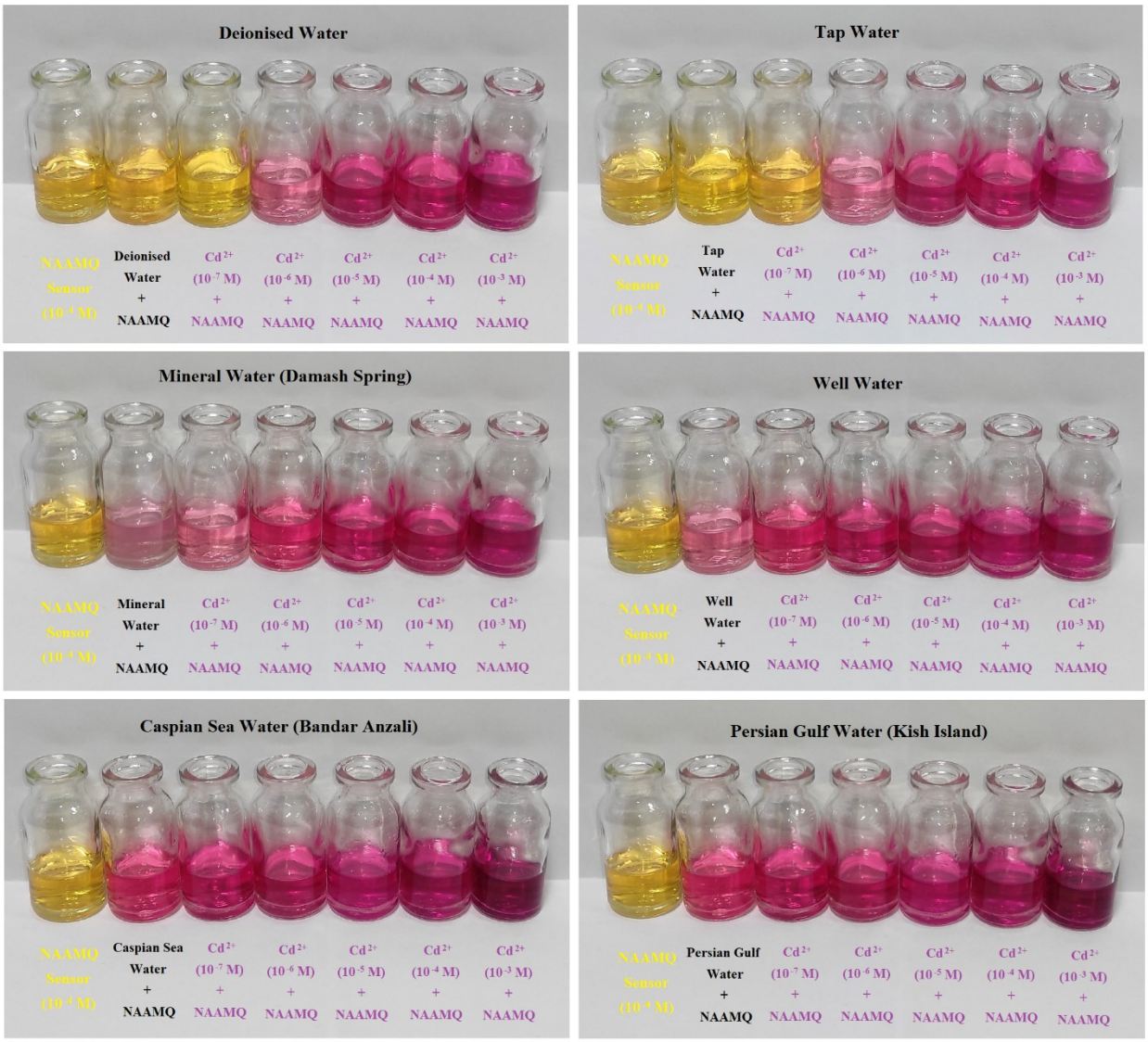


Figure S4. The color changes of the NAAMQ in acetonitrile/H_2O (60:40, v/v) upon the addition of water samples and different concentrations of Cd^{2+} ions at pH of 7.0.

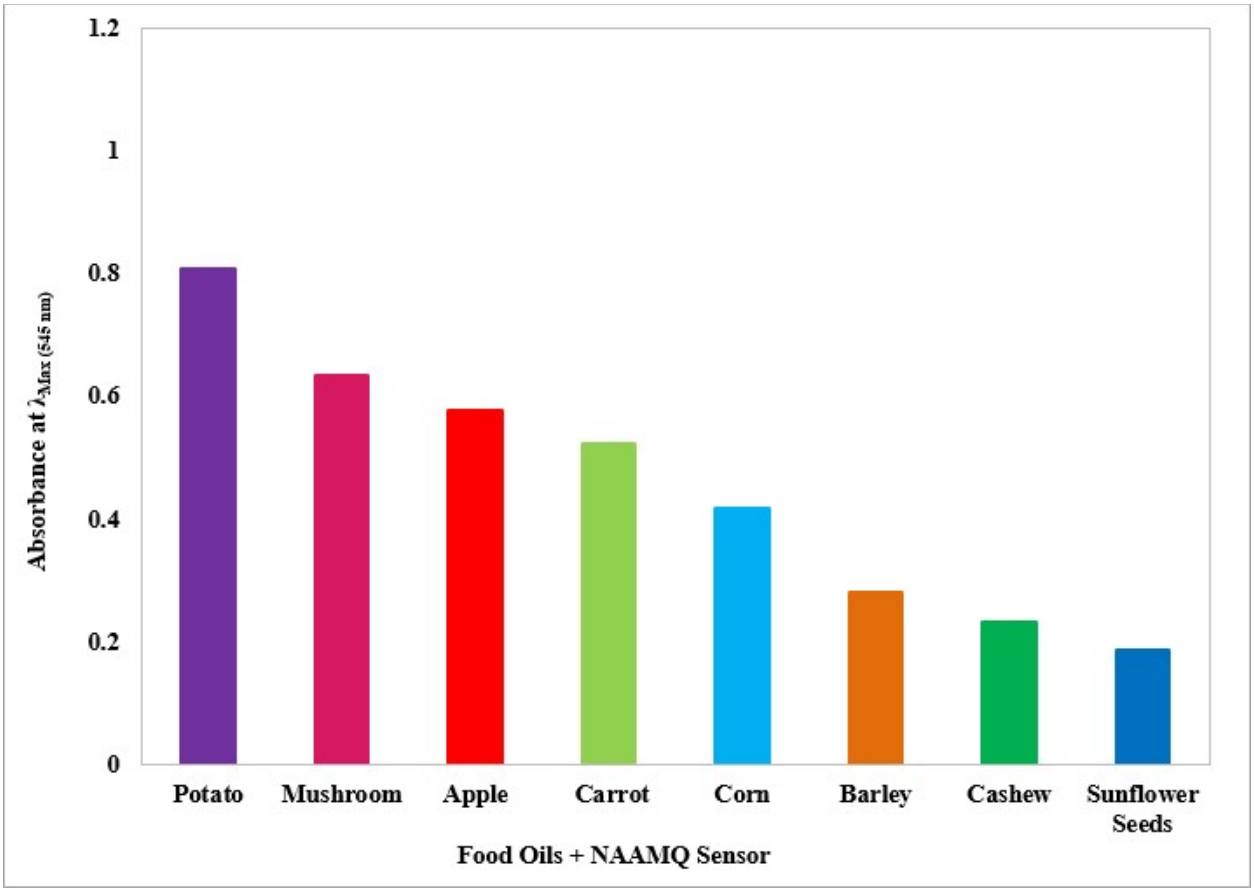


Figure S5. Absorption intensity of the NAAMQ for measure of Cd^{2+} ions in foodstuff samples (Acetonitrile/H_2O (60:40, v/v), pH = 7.0.).

Equation S1:

$$\frac{1}{A - A_0} = \left(\frac{1}{Ka[M]^n} \right) \times \frac{1}{A_{max} - A_0} + \frac{1}{A_{max} - A_0}$$

where A is the absorption of the NAAMQ-Cd^{2+} complex at different concentrations of the Cd^{2+} cation at the maximum wavelength, A_0 is the absorption of the sensor at the maximum wavelength, A_{max} is the maximum absorption of the NAAMQ-Cd^{2+} complex at the maximum wavelength, M is the Cd^{2+} cation concentration, Ka is the binding constant of the complex and *n* is a binding order.

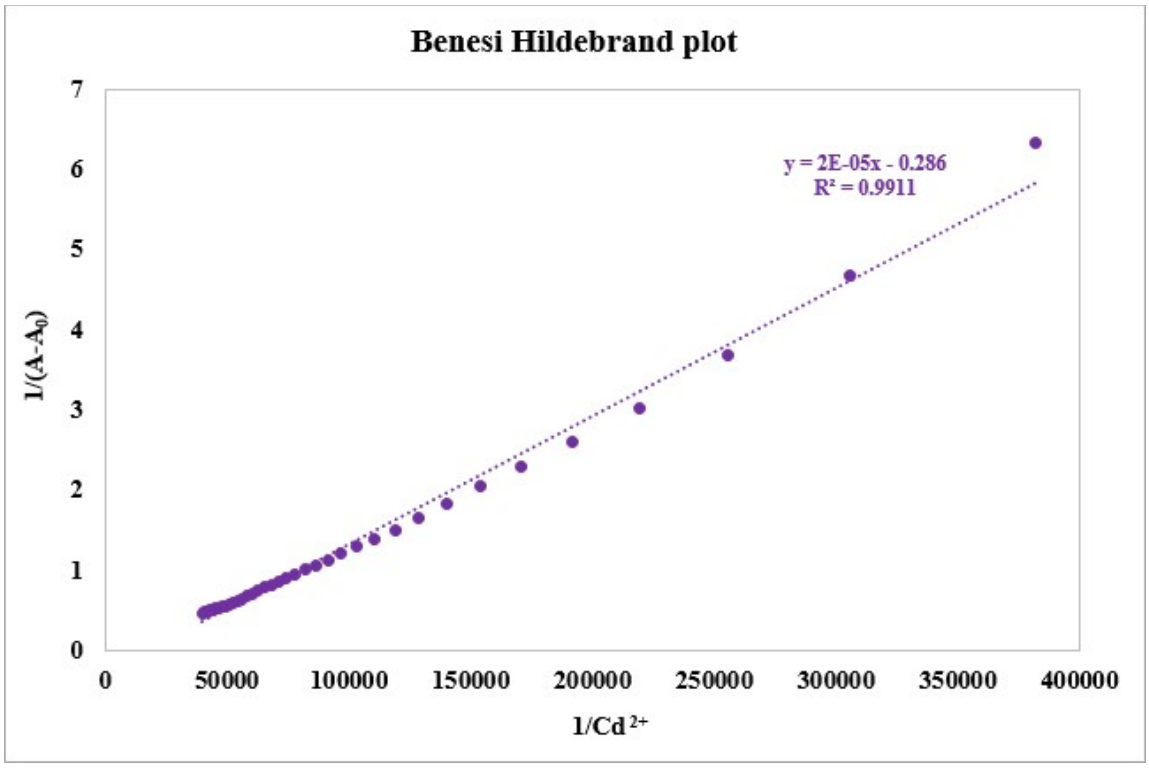


Figure S6. Benesi-Hildebrand plot of the NAAMQ-Cd^{2+} complex.

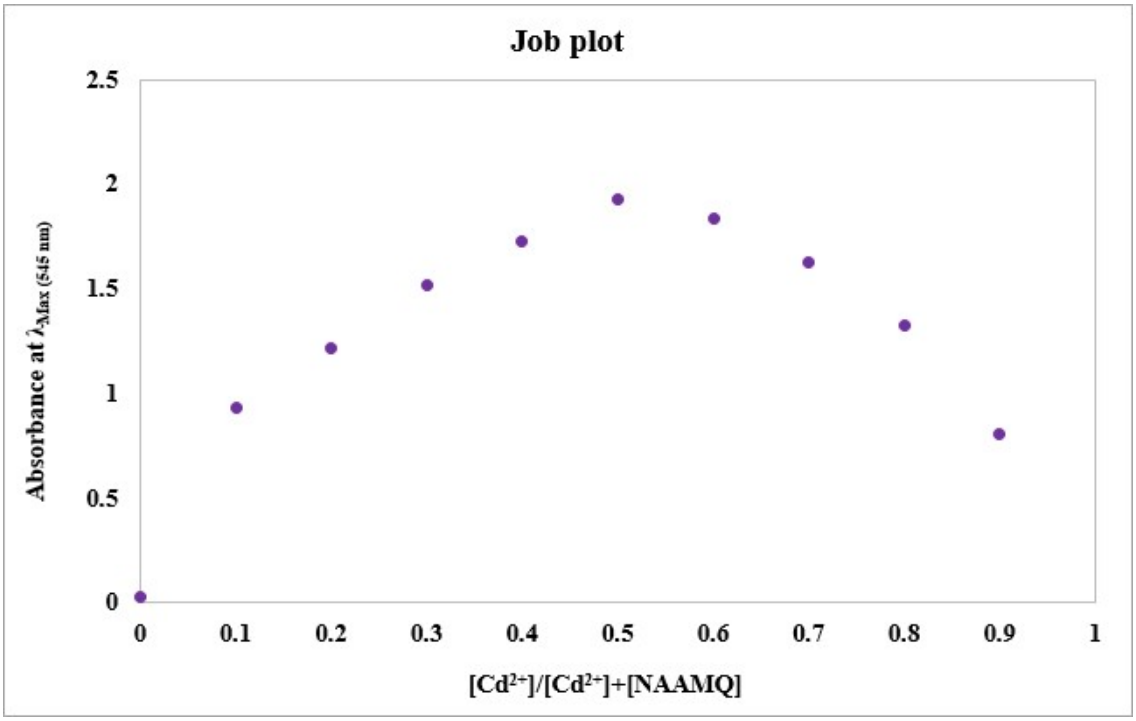


Figure S7. Job plot between NAAMQ and Cd^{2+} cation in acetonitrile/H_2O solution.