(Supplementary Information)

Fluorescence-Based Chemical Sensor for Detection of Melamine in Aqueous Solutions

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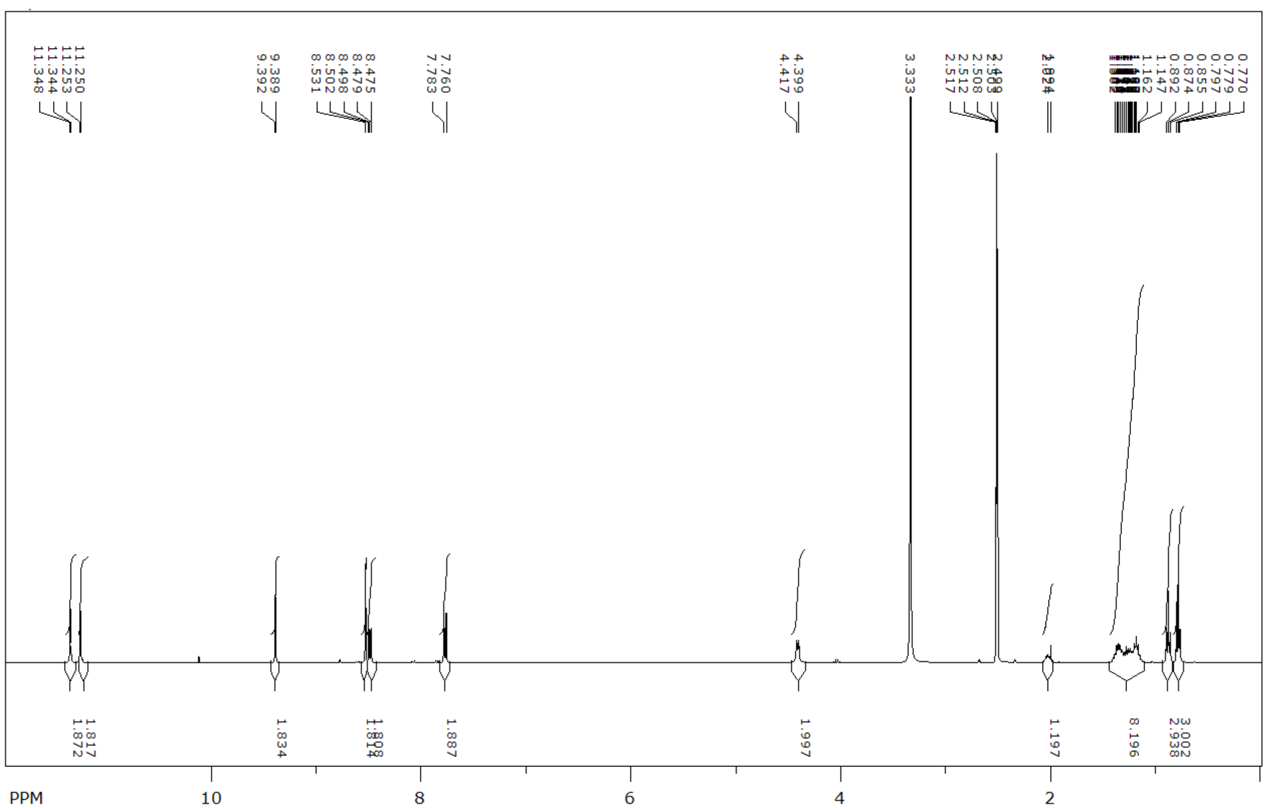

Figure S1: Proton NMR spectrum of CB in DMSO-d_6

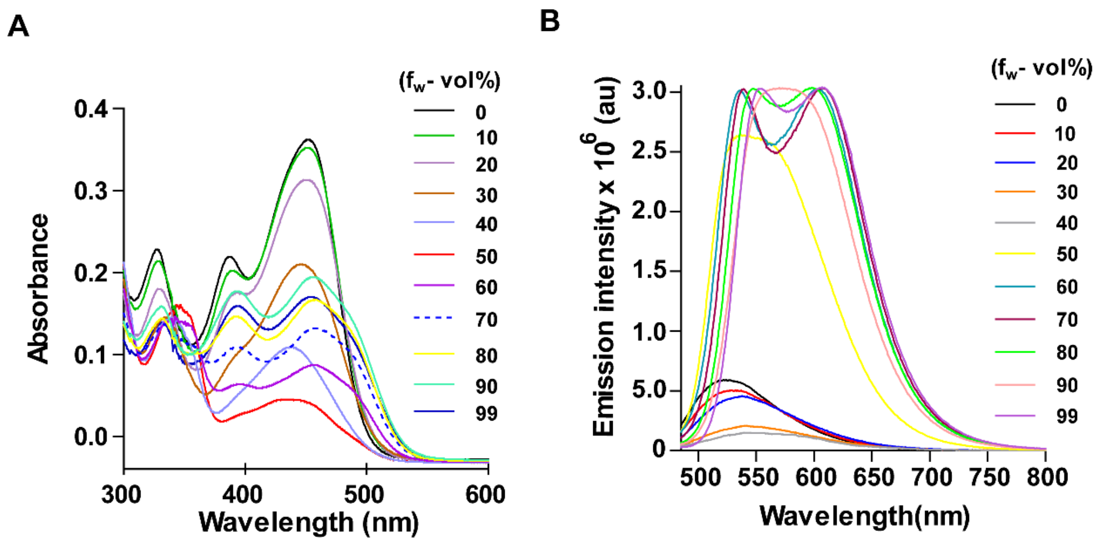

Figure S2: Absorbance and fluorescence spectra of CB. A) Emission spectra of CB (10 µM) for different f_w (0-99%). B) UV-vis absorption spectra of CB (10 µM) for f_w (0-99%).

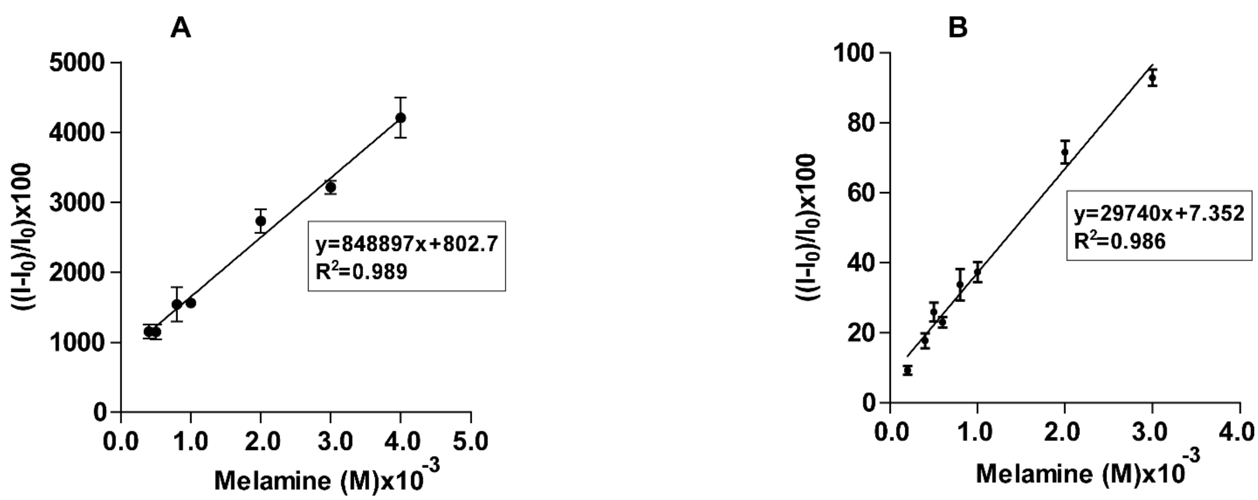

Figure S3: Effect of melamine concentration in **A)** distilled water and **B)** milk aqueous system on the fluorescence intensity of **CB-CA** solution (λ_{em} = 520 nm, λ_{ex} =490 nm). For the microplate experiment, 'I' represents the emission intensity (au) obtained from well solutions having different melamine levels and I_0 corresponds to the emission intensity of wells that are free of melamine. The error bars indicate the standard deviation values for the triplicate readings for the three different set of experiments.

Table S1: Comparison of reported detection methods for melamine.

Sample	Detection method	Limit of Detection (M)	Source
Milk powder	ELISA method based on monoclonal antibody	50 ng/g (3.9 x 10^{-7} M)	[1]
Infant formula powder	Microsphere-based flow cytometry	0.70 ng/ml (5.5 x 10^{-9} M)	[2]
Milk formula samples	Solid-phase extraction with activated attapulgite as sorbent	0.15 ng/ml (1.18 × 10^{-9} M)	[3]
Whole milk	Using Aptamer-modified gold nanoparticles (AuNPs) with UV-Vis spectrometer	0.5 mg/L (3.96 ×10^{-6} M)	[4]
Milk	Surface-enhanced Raman scattering substrate array	2.5 ppb (1.98×10^{-8} M)	[5]
Milk and milk products	Gas chromatography-tandem mass spectrometry	0.002 mg/kg (1.58 ×10^{-8} M)	[6]
Milk and milk products	surface-enhanced Raman spectroscopy using cyclodextrin-decorated silver nanoparticles	3.0 µg L−1 (2.3×10^{-5} M)	[7]
Infant milk samples	Electrochemical sensor detection using a modified glassy carbon electrode with ascorbic acid as the active recognition element.	5.0 ×10^{-9} M	[8]
Aqueous samples	Surface plasmon resonance based fiber optic sensor for the detection of melamine using molecular imprinting	9.87×10^{-9} M	[9]
Milk and milk powder	Differential pulse polarography.	3.0×10^{-7} M	[10]
Milk	**Current study**	**15.4 ppm (1.22×10^{-4} M)**	**This work**

References

1. Sun, F.; Liu, L.; Kuang, H.; Xu, C. Development of ELISA for Melamine Detection in Milk Powder. *Food Agric. Immunol.* **2013**, *24*, 79–86, doi:10.1080/09540105.2011.641170.
2. Tsoi, T.-H.; Wong, W.-T. A Simple, Highly Sensitive, High Throughput and Organic Solvent-Free Screening Method for Melamine by Microsphere-Based Flow Cytometry Immunoassay. *Anal. Methods* **2015**, *7*, 5989–5995, doi:10.1039/C5AY00648A.
3. Wang, T.-T.; Xuan, R.-R.; Ma, J.-F.; Tan, Y.; Jin, Z.-F.; Chen, Y.-H.; Zhang, L.-H.; Zhang, Y.-K. Using Activated Attapulgite as Sorbent for Solid-Phase Extraction of Melamine in Milk Formula Samples. *Anal. Bioanal. Chem.* **2016**, *408*, 6671–6677, doi:10.1007/s00216-016-9779-2.

4. Yun, W.; Li, H.; Chen, S.; Tu, D.; Xie, W.; Huang, Y. Aptamer-Based Rapid Visual Biosensing of Melamine in Whole Milk. *Eur. Food Res. Technol.* **2014**, *238*, 989–995, doi:10.1007/s00217-014-2166-3.
5. Rajapandiyan, P.; Tang, W.-L.; Yang, J. Rapid Detection of Melamine in Milk Liquid and Powder by Surface-Enhanced Raman Scattering Substrate Array. *Food Control* **2015**, *56*, 155–160, doi:10.1016/j.foodcont.2015.03.028.
6. Miao, H.; Fan, S.; Wu, Y.-N.; Zhang, L.; Zhou, P.-P.; Chen, H.-J.; Zhao, Y.-F.; Li, J.-G. Simultaneous Determination of Melamine, Ammelide, Ammeline, and Cyanuric Acid in Milk and Milk Products by Gas Chromatography-Tandem Mass Spectrometry. *Biomed. Environ. Sci.* **2009**, *22*, 87–94, doi:10.1016/S0895-3988(09)60027-1.
7. Ma, P.; Liang, F.; Sun, Y.; Jin, Y.; Chen, Y.; Wang, X.; Zhang, H.; Gao, D.; Song, D. Rapid Determination of Melamine in Milk and Milk Powder by Surface-Enhanced Raman Spectroscopy and Using Cyclodextrin-Decorated Silver Nanoparticles. *Microchim. Acta* **2013**, *180*, 1173–1180, doi:10.1007/s00604-013-1059-7.
8. Daizy, M.; Tarafder, C.; Al-Mamun, Md.R.; Liu, X.; Aly Saad Aly, M.; Khan, M.Z.H. Electrochemical Detection of Melamine by Using Reduced Graphene Oxide–Copper Nanoflowers Modified Glassy Carbon Electrode. *ACS Omega* **2019**, *4*, 20324–20329, doi:10.1021/acsomega.9b02827.
9. Shrivastav, A.M.; Mishra, S.K.; Gupta, B.D. Fiber Optic SPR Sensor for the Detection of Melamine Using Molecular Imprinting. *Sens. Actuators B Chem.* **2015**, *212*, 404–410, doi:10.1016/j.snb.2015.02.028.
10. Yilmaz, Ü.T.; Yazar, Z. Determination of Melamine by Differential Pulse Polarography/Application to Milk and Milk Powder. *Food Anal. Methods* **2012**, *5*, 119–125, doi:10.1007/s12161-011-9214-4.