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Nitrogenous carbon dot decorated natural microcline: An ameliorative dual fluorometric probe for Fe^{3+} and Cr^{6+} detection

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Supplementary data

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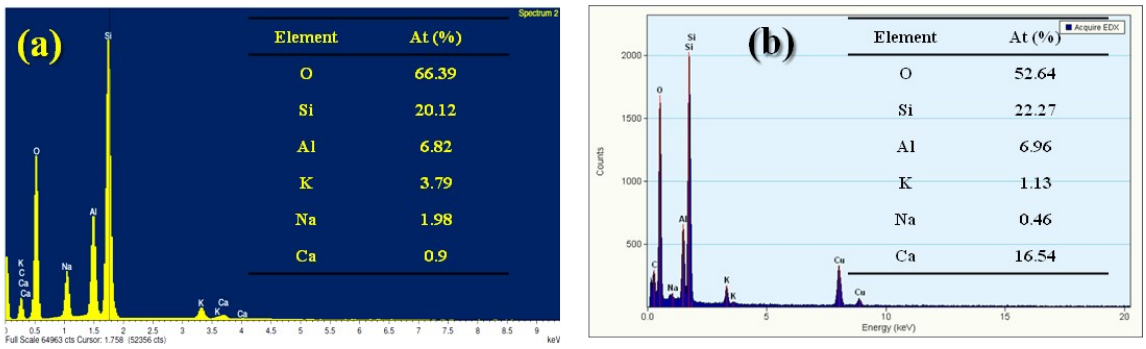

Figure S1: EDX images of (a) M and (b) MCD, showing their purity.

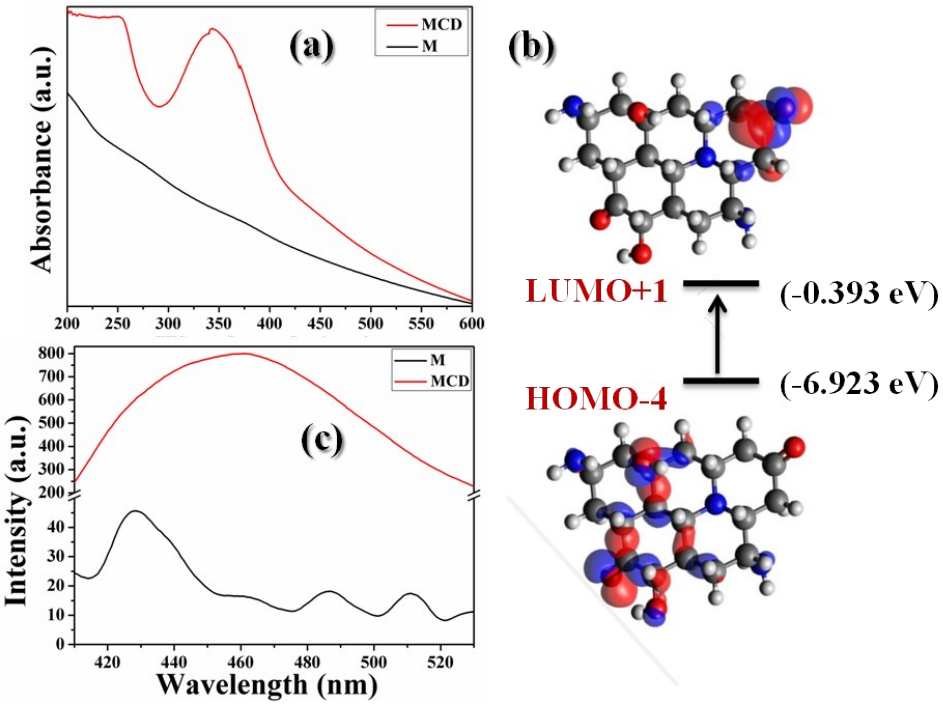

Figure S2: (a) UV-vis spectra of M and MCD; (b) TDDFT analysis of MCD showing transition during light absorption; (c) PL spectra depicting the comparison of fluorescence properties of M and MCD at 370nm excitation

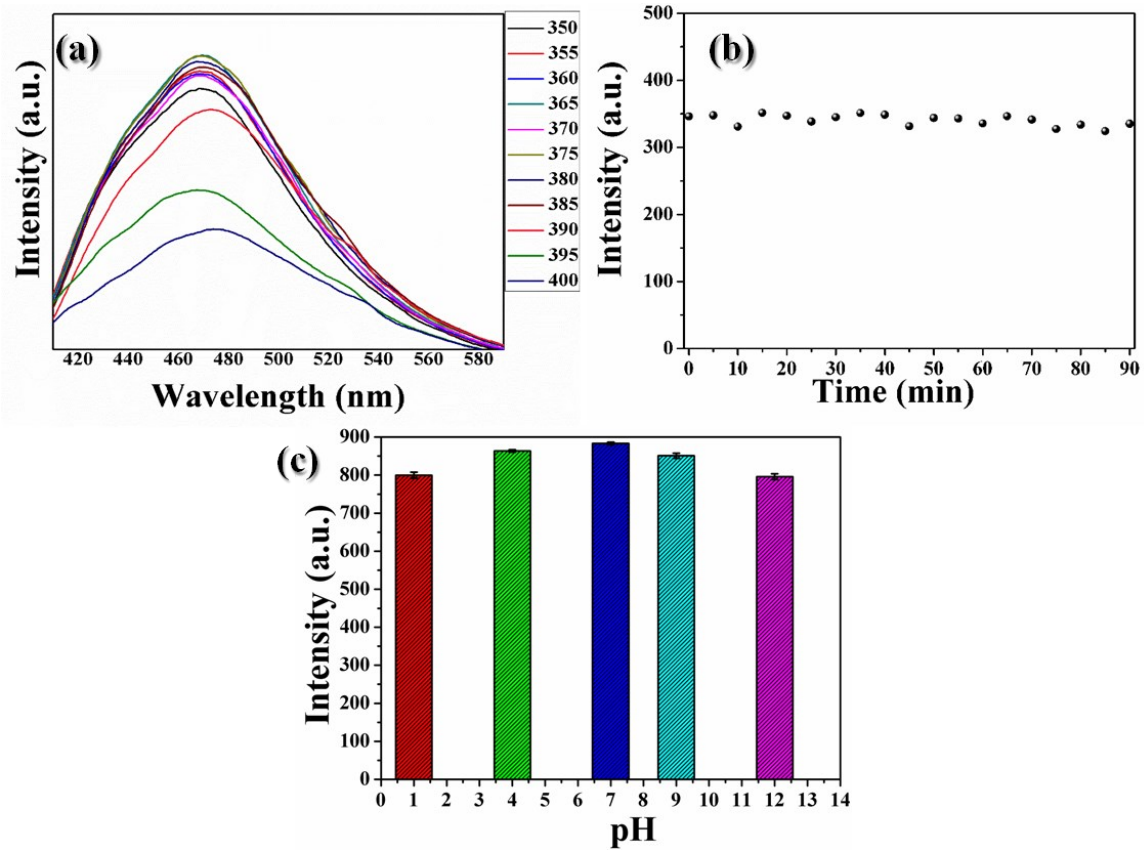

Figure S3: (a) Fluorescence spectra of MCD at different excitation wavelengths ranging from 330 nm-400 nm; (b) Photo-stability of MCD recorded for 90 min; (c) Fluorescence stability of MCD at various pH

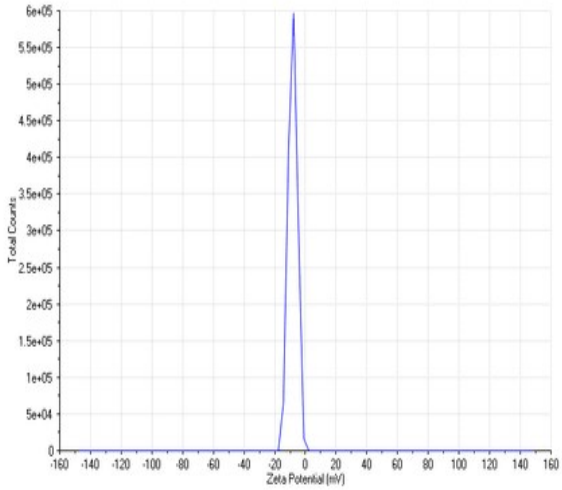

Figure S4: Surface charge of the sensor material (MCD) obtained from Zeta potential analysis

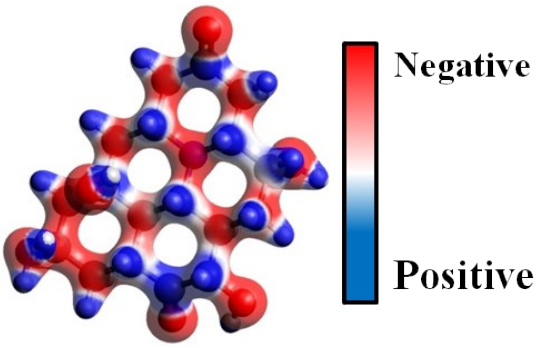

Figure S5: Electron density mapping from DFT analysis of C-dot showing active binding sites for ions

Sensor Material	Source	Contami-nant	Detection Limit (µM)	Linear Range	Single/ Multiple sensing	Ref
$[Zn_2(ttz)H_2O]$ n	Synthesized	Cr^{6+}	20	$18–1.8×10^3$	Single	1
$[Eu(Hpzbc)_2$ $(NO_3)].H_2O$	Synthesized	Cr^{6+} & Fe^{3+}	22 26	~10-$1.0×10^3$ 0 − $220×10^{-6}$M	Multiple	2
Zn-MOF	Synthesized	Cr^{6+} & Cr^{3+}	3.9 4.9	10-300	Multiple	3
Rhodamine-based derivative	Synthesized	Fe^{3+} & Cu^{2+}	100	0.225 - 0.525 mM	Multiple	4
Carbon dot	Natural	Cr^{6+}	0.1	0-70 µM	Single	5
Poly(3,4-propylenedioxythiophene) derivative	Synthesized	Fe^{3+}	23	0-0.10 nM	Single	6
Carbon dot	Natural	Fe^{3+}	0.48 0.29	1-10 µM 1-8 µM	Single	7
MCD	**Natural**	**Cr^{6+} & Fe^{3+}**	**~4 ~19**	**0-34 µM**		**This work**

Table S1: Comparative study with other recent literatures

References:

(1) Cao, C.-S.; Hu, H.-C.; Xu, H.; Qiao, W.-Z.; Zhao, B. Two Solvent-Stable MOFs as a Recyclable Luminescent Probe for Detecting Dichromate or Chromate Anions. *CrystEngComm* **2016**, *18*, 4445-4451.

(2) Li, G.-P.; Liu, G.; Li, Y.-Z.; Hou, L.; Wang, Y.-Y.; Zhu, Z. Uncommon Pyrazoyl-Carboxyl Bifunctional Ligand-Based Microporous Lanthanide Systems: Sorption and Luminescent Sensing Properties. *Inorg. Chem.* **2016,** *55*, 3952-3959.

(3) Lv, R.; Wang, J.; Zhang, Y.; Li, H.; Yang, L.; Liao, S.; Gu, W.; Liu, X. An Amino-Decorated Dual-Functional Metal-Organic Framework for Highly Selective Sensing of Cr(III) and Cr(VI) Ions and Detection of Nitroaromatic Explosives. *J. Mater. Chem. A* **2016,** *4*, 15494-15500.

(4) Weerasinghe, A. J.; Abebe, F. A.; Sinn, E. Rhodamine based turn-ON dual sensor for Fe^{3+} and Cu^{2+}. *Tetrahedron Lett.* **2011,** *52,* 5648-5651.

(5) Tai, D.; Liu, C.; Liu, J. Facile synthesis of fluorescent carbon dots from shrimp shells and using the carbon dots to detect chromium (VI). *Spectros Lett.* **2019,** *52(3-4),* 194-199.

(6) Chen, X.; Zhao, Q.; Zou, W.; Qu, Q.; Wang, F. A colorimetric Fe^{3+} sensor based on an anionic poly (3, 4-propylenedioxythiophene) derivative. *Sensor Actuat B-Chem.* **2017**, 244, 891-6.

(7) Wang, N.; Wang, Y.; Guo, T.; Yang, T.; Chen, M.; Wang, J. Green preparation of carbon dots with papaya as carbon source for effective fluorescent sensing of Iron (III) and Escherichia coli. *Biosensors and Bioelectronics,* **2016,** *85,* 68-75.