

Green-emitting AIEgen for instantaneous fluorescent switch-off detection of uranyl ions in environmental water samples

Kanishk Bhardwaj^a, Ritambhara Jangir^a, Arup Kumar Ghosh^a, Bigyan R Jali^b, Ashok Kumar SK^c and Suban K. Sahoo^{a,*}

^a Department of Chemistry, Sardar Vallabhbhai National Institute Technology, Surat-395007, Gujarat, India.

^b Department of Chemistry, Veer Surendra Sai University of Technology, Burla, Sambalpur-768018, Odisha, India.

^c Department of Chemistry, School of Advance Sciences, Vellore Institute of Technology, Vellore, 632014, Tamil Nadu, India.

*E-mail (Dr. Sahoo): sks@chem.svnit.ac.in.

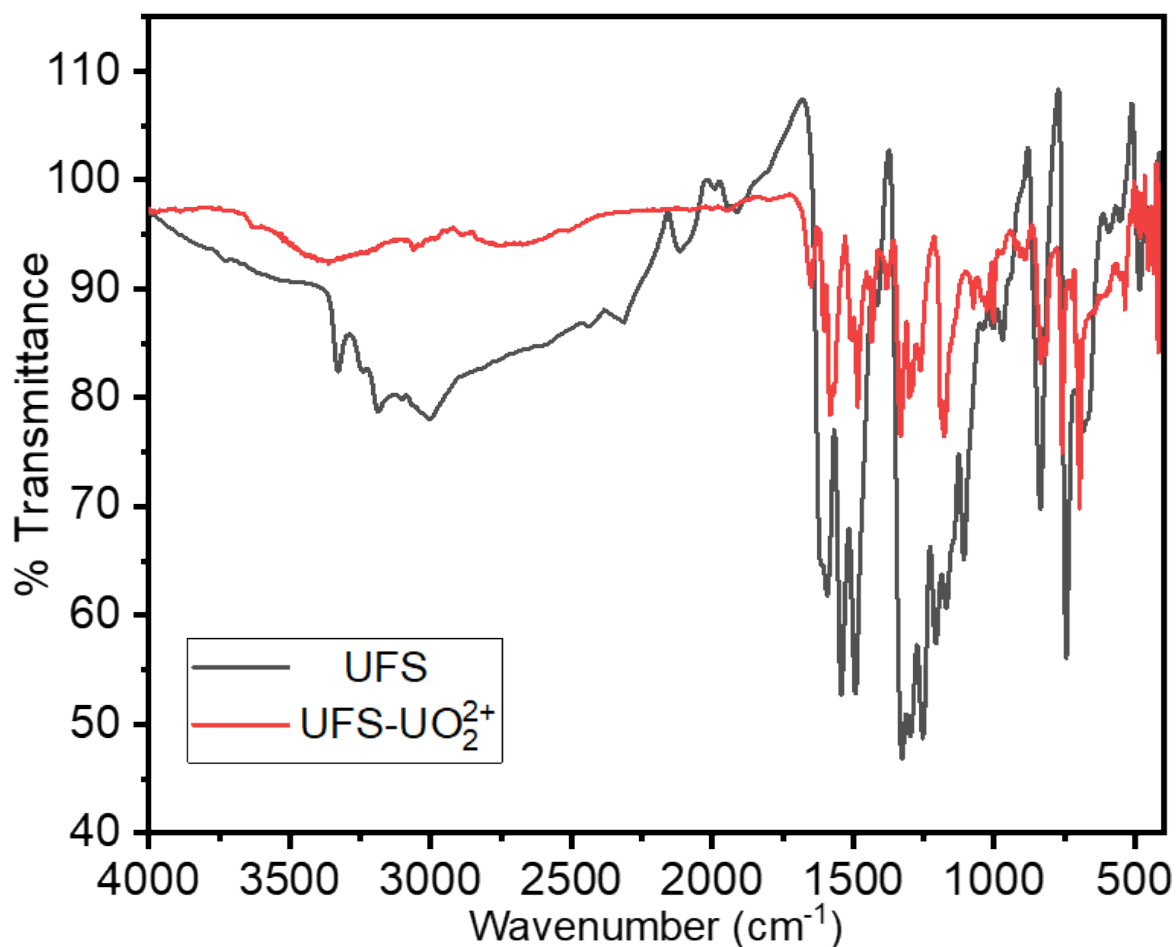


Fig. S1. FT-IR spectra of UFS and UFS-UO₂²⁺ complex.

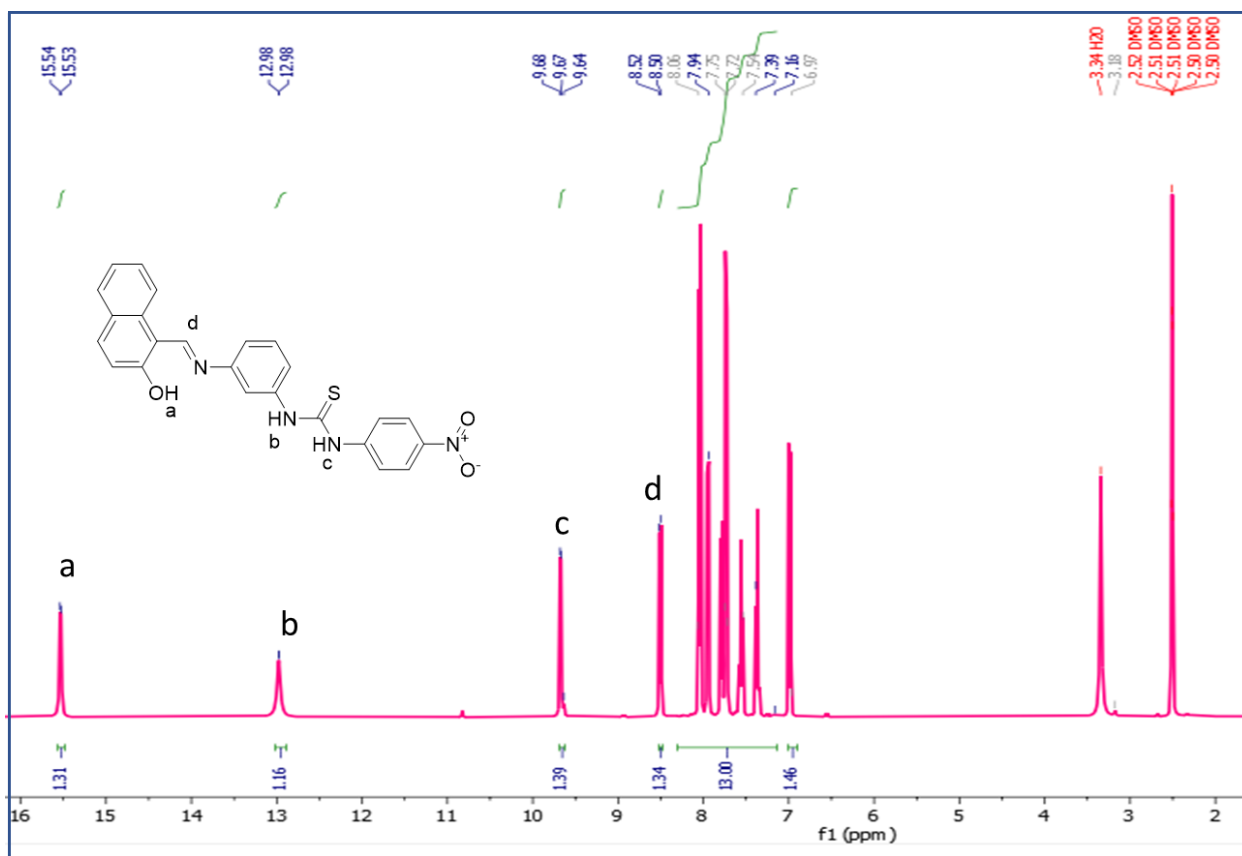


Fig. S2. ¹H NMR spectrum of UFS in DMSO-*d*₆.

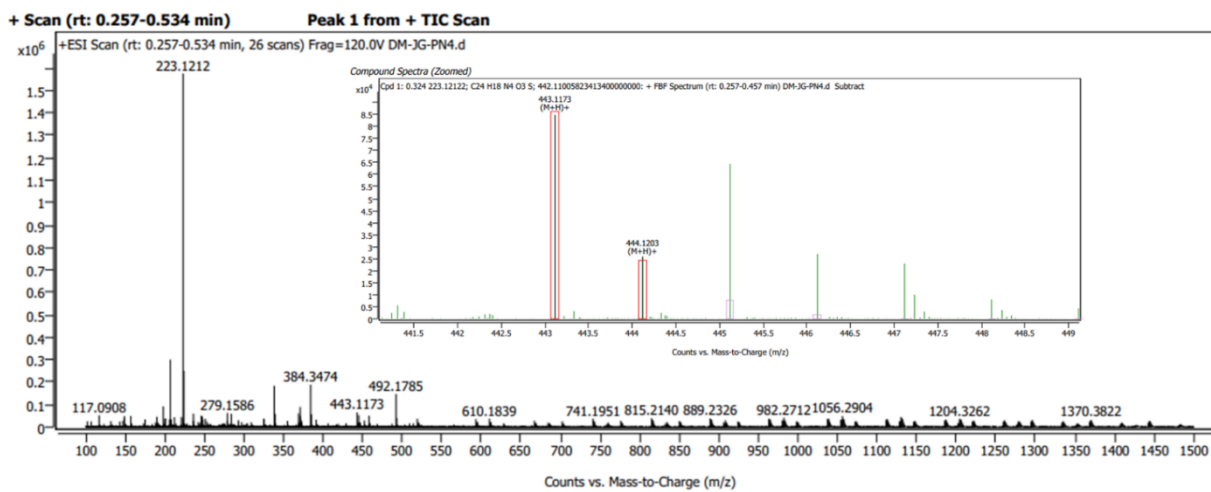


Fig. S3. Mass spectrum of UFS.

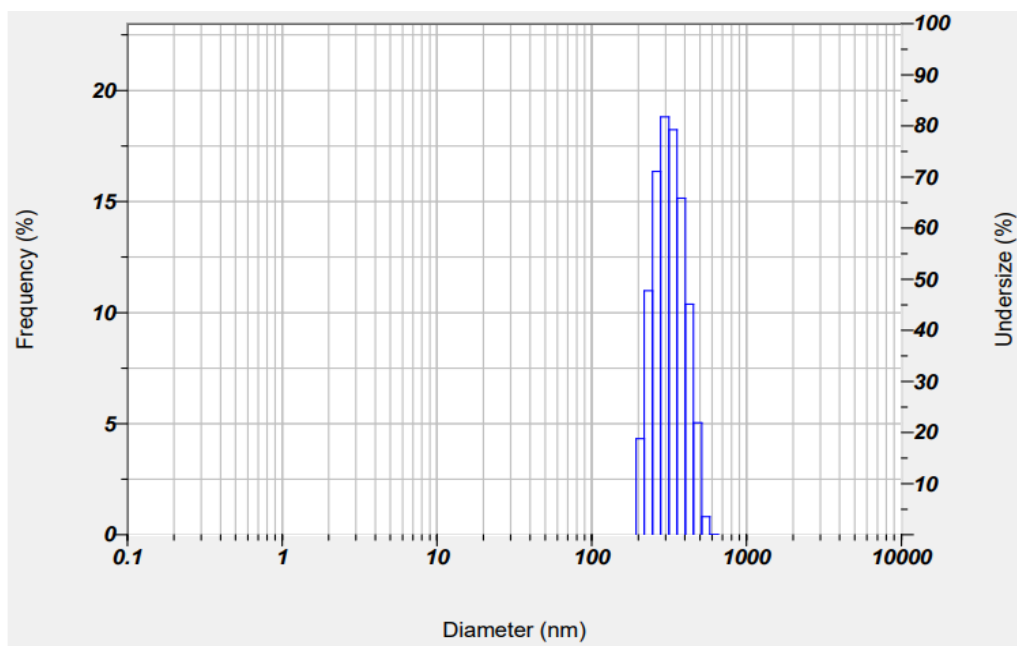


Fig. S4. DLS of AIEgen UFS (5×10^{-5} M) in DMSO containing $f_w = 95\%$.

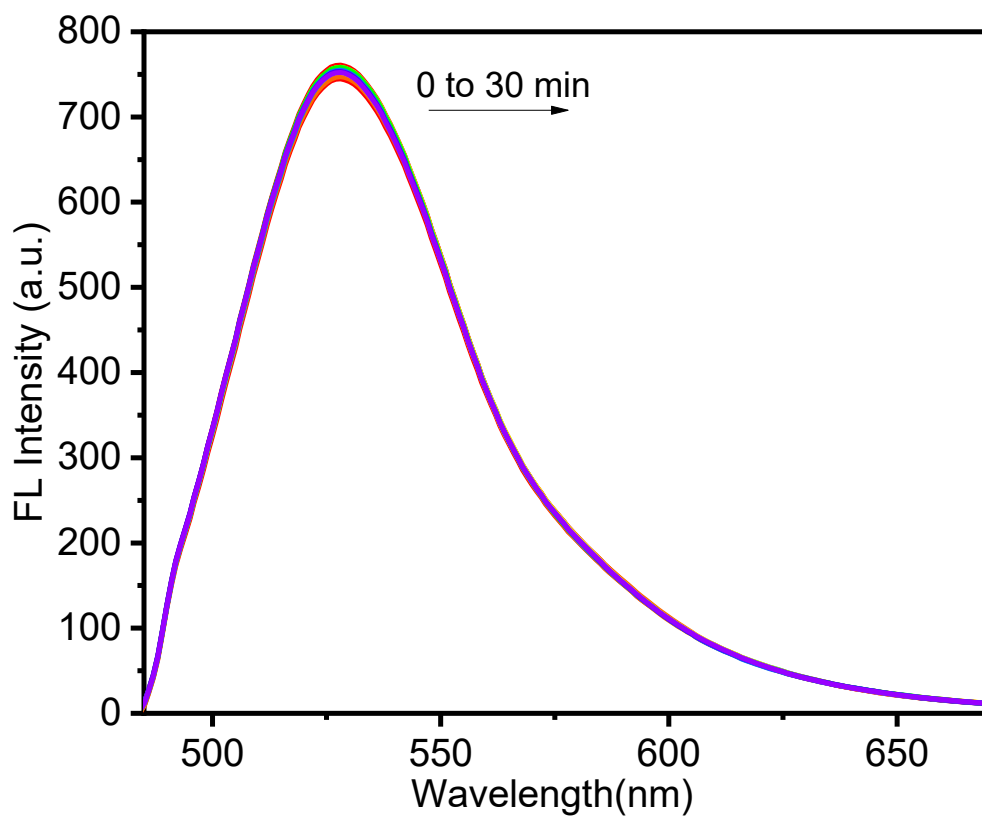


Fig. S5. Time-dependent fluorescence spectra of AIEgen UFS (5×10^{-5} M) in DMSO containing $f_w = 95\%$.

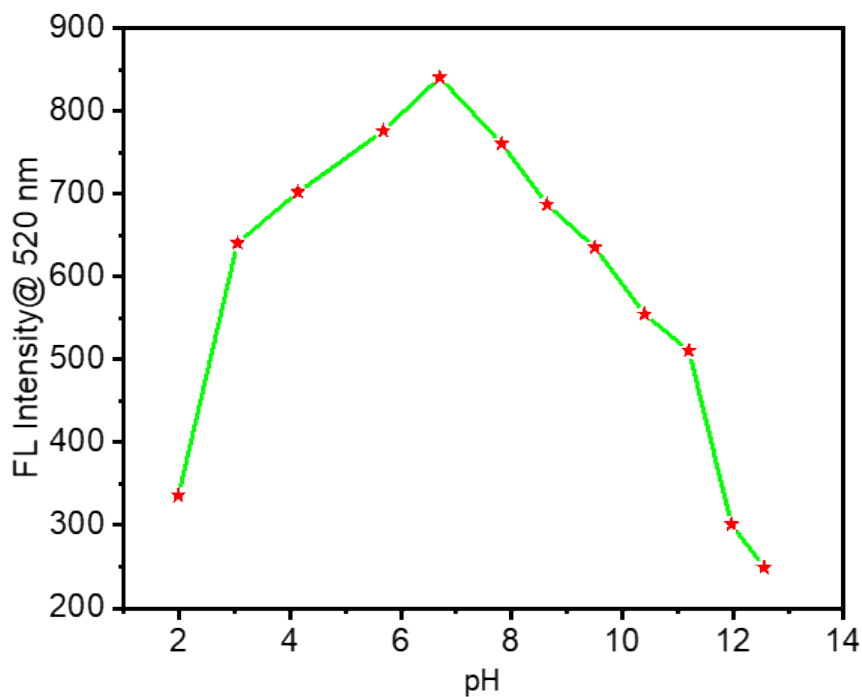


Fig. S6. Fluorescence spectral changes of AIEgen UFS (5×10^{-5} M) in DMSO:H₂O ($f_w = 95\%$) at different pH.

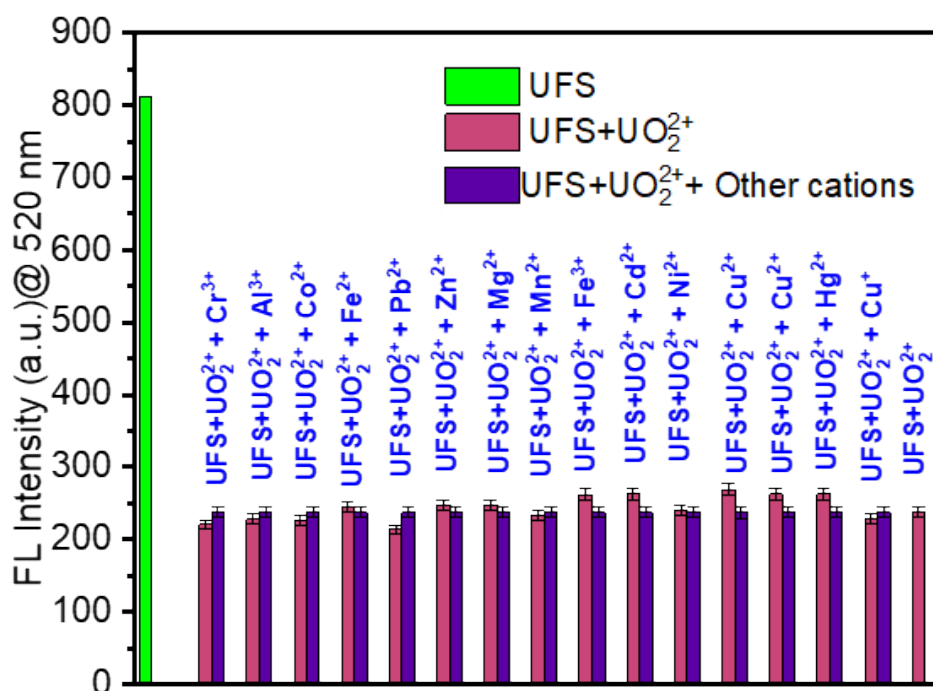


Fig. S7. The bar representation of selectivity and anti-interference test of the AIEgen UFS for detecting UO₂²⁺ in H₂O/DMSO ($f_w = 95\%$).

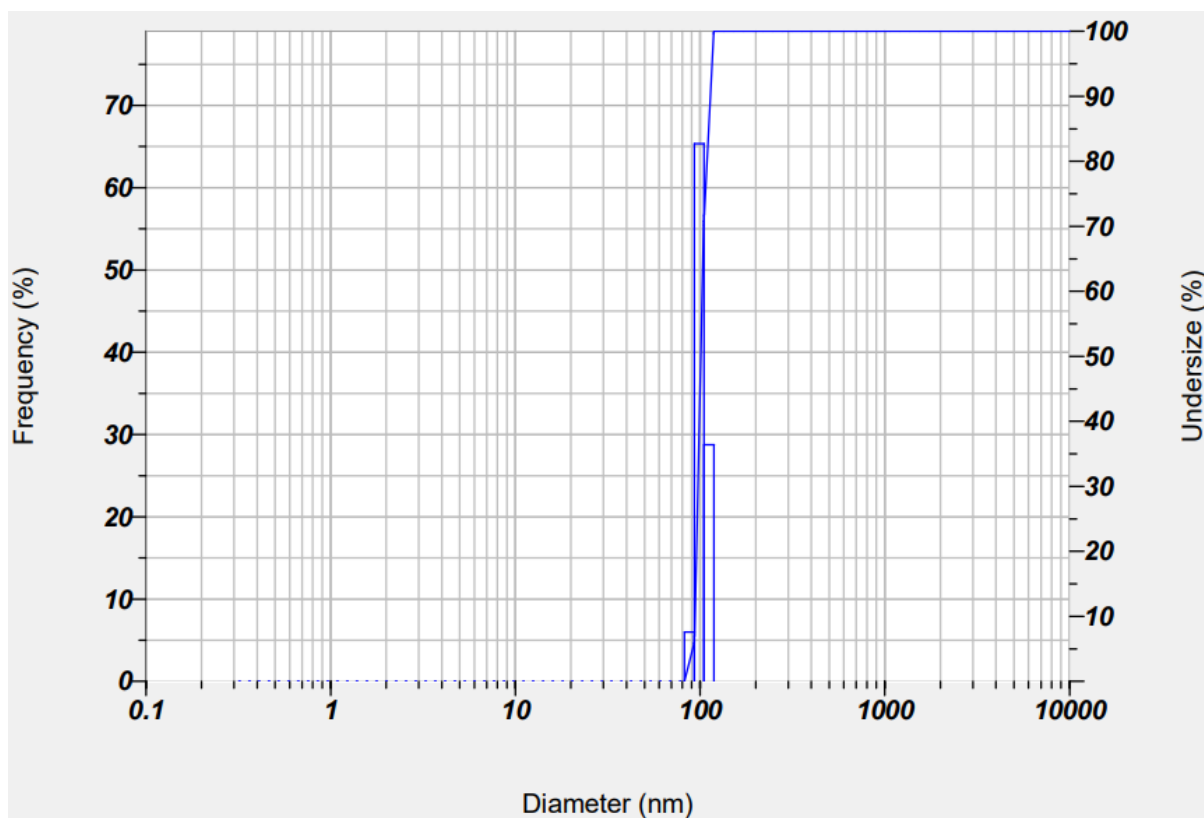


Fig. S8. DLS of AIEgen UFS (5×10^{-5} M) containing UO_2^{2+} (2.5×10^{-5} M) in DMSO containing $f_w = 95\%$.

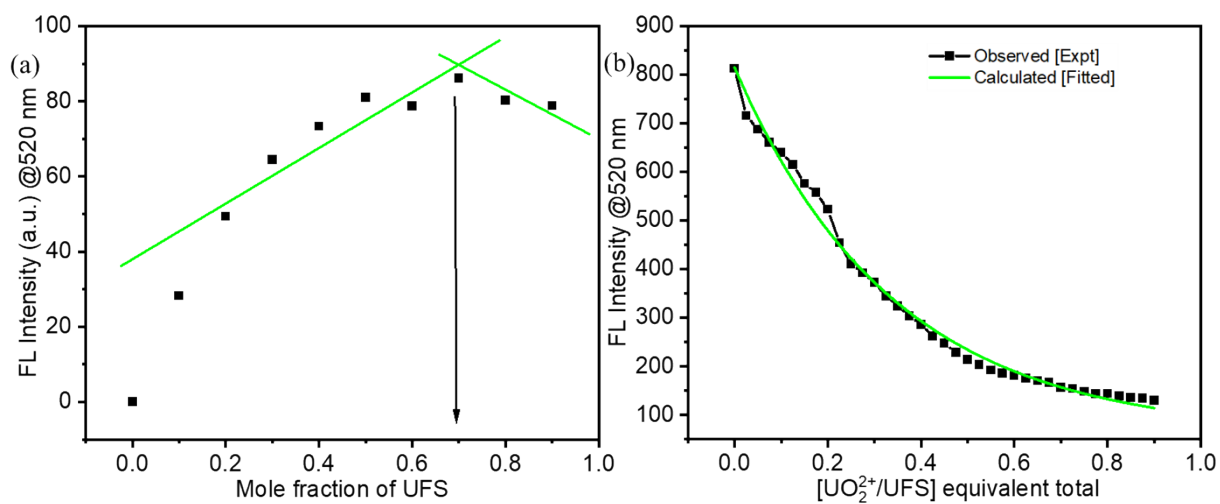


Fig. S9. (a) Job's plot of UFS- UO_2^{2+} complex. (b) Bindfit plot for UFS- UO_2^{2+} complex.

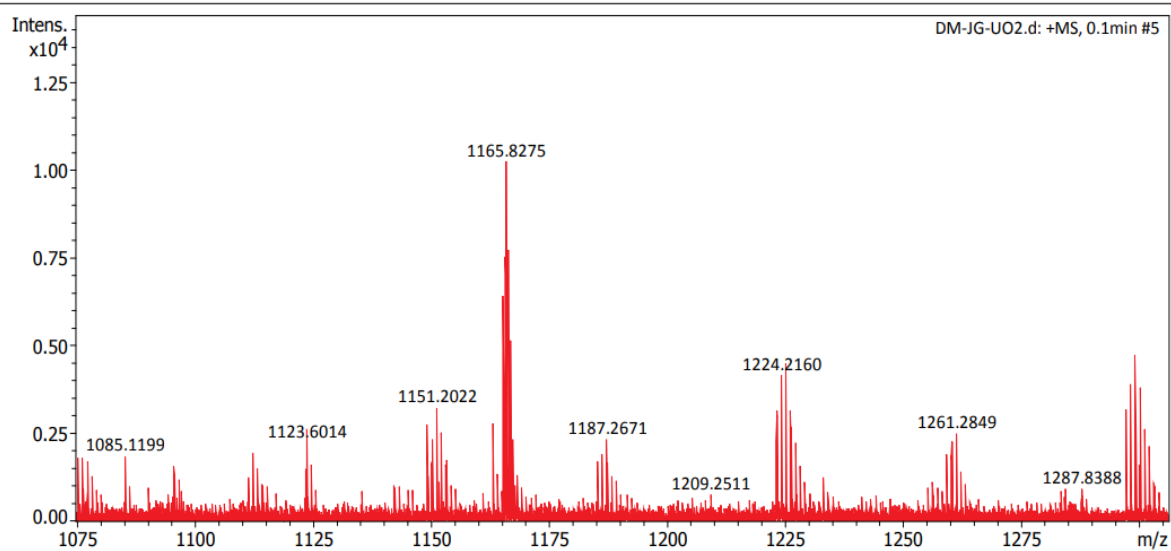


Fig. S10. Mass spectrum of UFS-UO₂²⁺ complex.

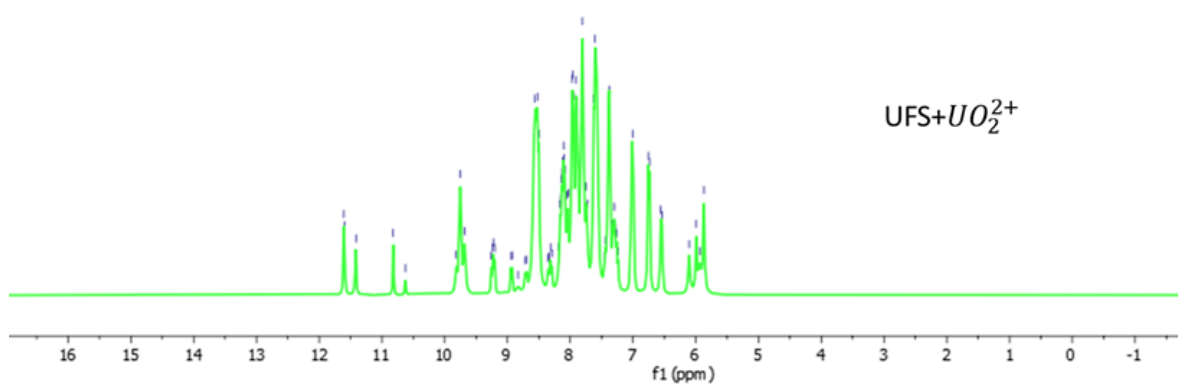


Fig. S11. ¹H NMR spectrum of UFS-UO₂²⁺ complex in DMSO-*d*₆.

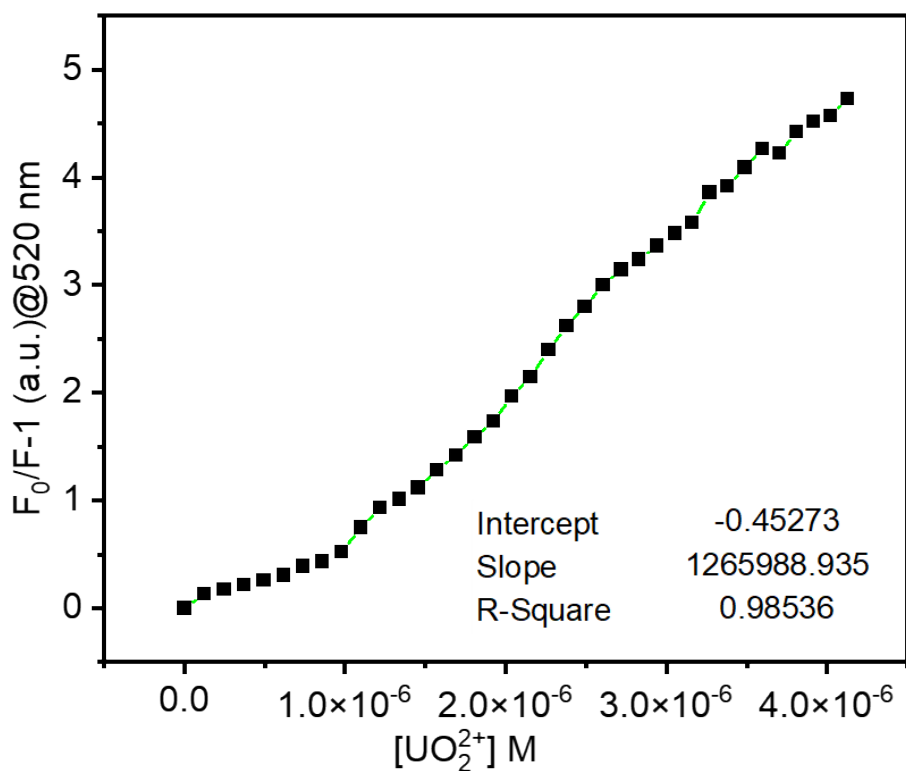


Fig. S12. Stern-Volmer plots of UFS-UO₂²⁺ complex.

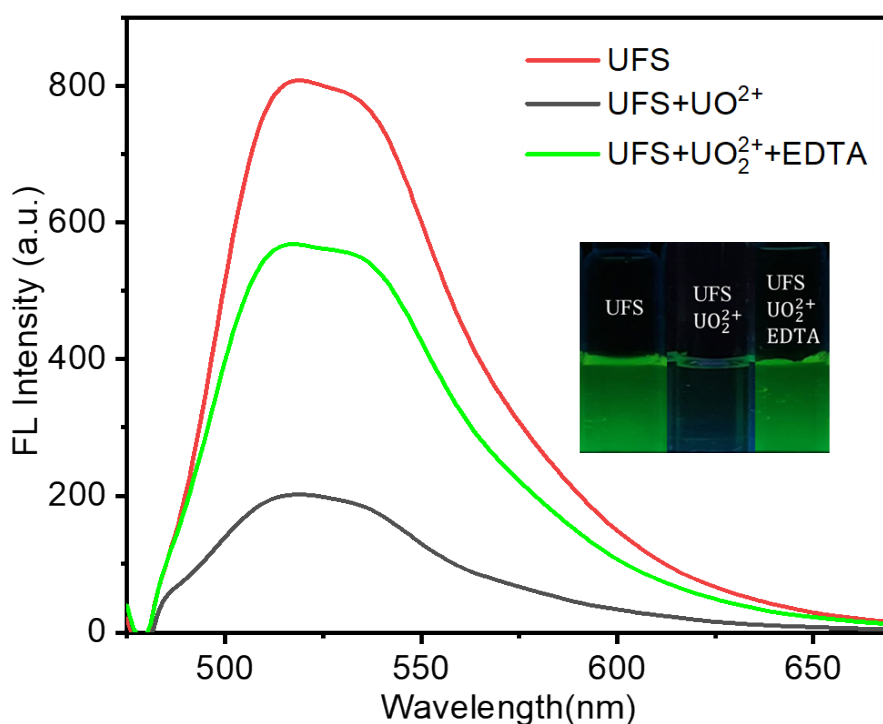


Fig. S13. Fluorescence spectra of AIEgen UFS (5×10^{-5} M) with the addition of UO₂²⁺ ions (100 μ L, 5×10^{-4} M) followed by the addition of EDTA (100 μ L, 5×10^{-4} M) in DMSO:H₂O ($f_w = 95\%$).

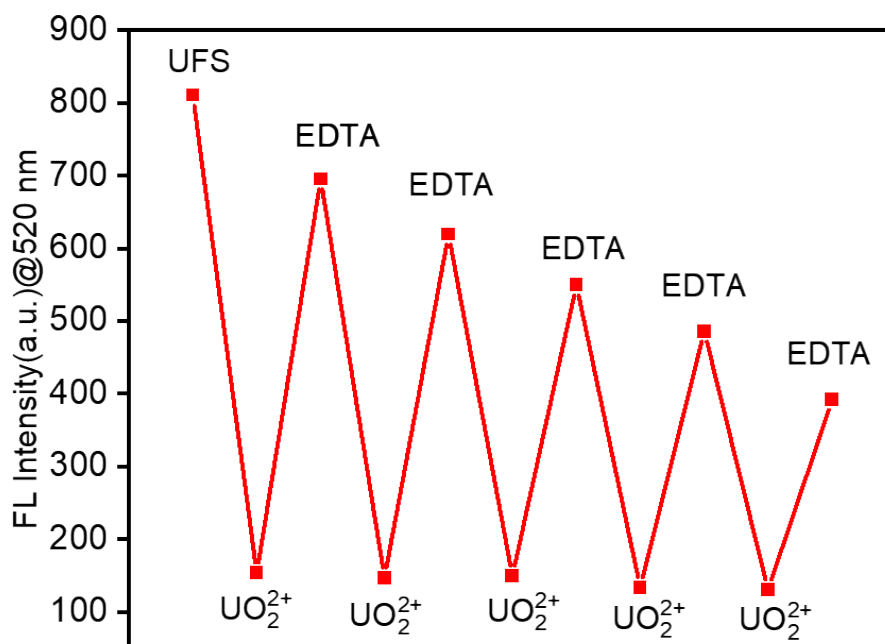


Fig. S14. Reversibility cycle of AIEgen UFS (5×10^{-5} M) after the sequential addition of UO_2^{2+} (5×10^{-4} M) and EDTA (5×10^{-4} M).

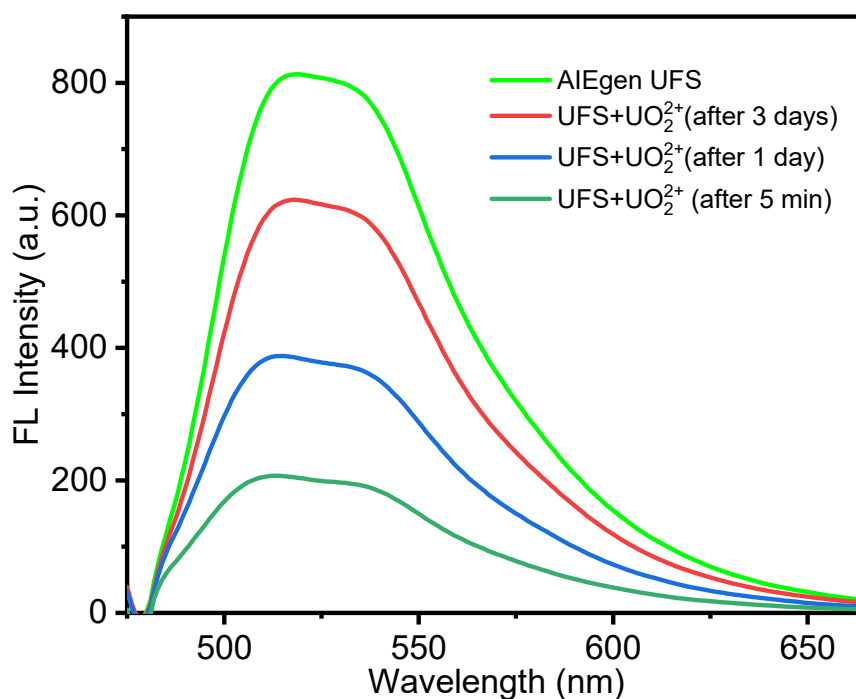
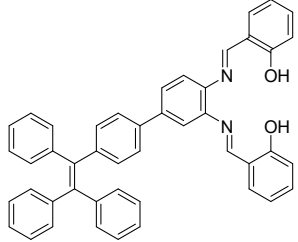
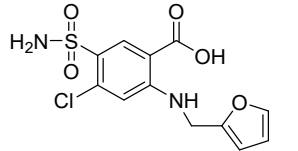
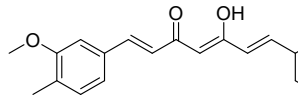
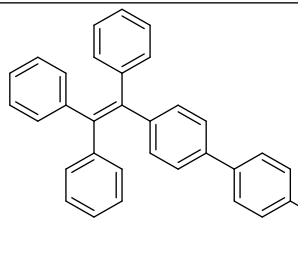
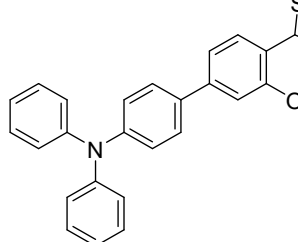
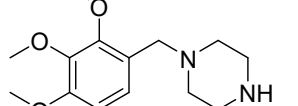
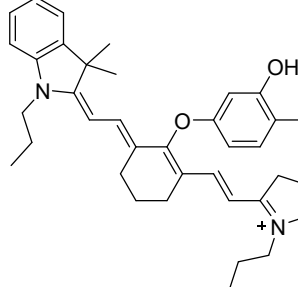


Fig. S15. Fluorescence spectra of AIEgen UFS (2 mL, 5×10^{-5} M) with the UO_2^{2+} solution (100 μL). The solution was taken from the 2 mL UO_2^{2+} solution (5×10^{-4} M) kept with the UFS gelatin gel.

Table S1. Comparison of the performance between AIEgen UFS and the reported fluorescence uranyl ion probes.

Probes	λ_{ex} / nm	λ_{em} / nm	Detection limit	Response mode	Response time (min)	Ref. .
	370	548	39 nM	Fluorescence turn-off	10	1
	320	522	46 nM	Fluorescence turn-on	5	2
	740	795	93 nM	Fluorescence turn-off	40	3
	340	485	7.9 nM	Fluorescence turn-off	1	4
	350	510	500 nM	Fluorescence turn-off	1	5
	340	374	41 nM	Fluorescence turn-on	10-15	6
	740	795	93 nM	Fluorescence turn-off	40	7
AIEgen UFS	450	520	87.3 nM	Fluorescenc	Instantaneousl	

				e turn-off	y	
--	--	--	--	------------	---	--

Table S2. Fluorescence lifetime decay parameters of AIEgen UFS in the absence and presence of UO_2^{2+} ion.

Compounds	τ_1 (ns)	τ_2 (ns)	τ_3 (ns)	Avg. time (ns)
UFS	4.12	8.25	0.16	4.17
UFS- UO_2^{2+}	2.62	5.25	0.10	2.65

References

1. N. Lin, W. Ren, J. Hu, B. Gao, D. Yuan, X. Wang and J. Fu, *Dyes and Pigments*, 2019, **166**, 182-188.
2. A. Elabd and O. Elhefnawy, *Journal of fluorescence*, 2016, **26**, 271-276.
3. J.-H. Zhu, X. Zhao, J. Yang, Y.-T. Tan, L. Zhang, S.-P. Liu, Z.-F. Liu and X.-L. Hu, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 2016, **159**, 146-150.
4. Y. Zhan, X. Lu, T. Lan, Q. Tian, J. Shen and W. He, *Dyes and Pigments*, 2023, **216**, 111299.
5. M. Zheng, Q. Yin, D. Wang, Z. Zhao, Q. Hu and H. Wang, *Microchemical Journal*, 2021, **167**, 106302.
6. A. Elabd and M. Attia, *Journal of Luminescence*, 2015, **165**, 179-184.
7. Y. Zhang, L. Sun, Q. Yan, X. Qiu, Y. Cheng, B. Wang, X. Tan, M. Fang, R. L. Luck and H. Liu, *Microchemical Journal*, 2022, **180**, 107619.
