XXI Brazilian Meeting on Inorganic Chemistry
X Brazilian Meeting on Rare Earths
III Workshop on Theoretical Bioinorganic Chemistry
Belo Horizonte, September 12 - 15th 2024

Novel discrete and imprinted fluoride-selective sensors: bridging the gap from DMSO to aqueous samples

Delfina Quiñone,[a,b] Giammarco M. Romano,[c] Matteo Savastano,[d] Antonio Bianchi,[c] Andrea Bencini,[c] Margarita Brovetto,[e*] Julia Torres,[a*] Nicolás Veiga,[a*]

[a] *Química Inorgánica, Departamento Estrella Campos, Facultad de Química, Universidad de la República, Montevideo, Uruguay.*
[b] *Graduate Program in Chemistry, Facultad de Química, Universidad de la República, Uruguay.*
[c] *Department of Chemistry 'Ugo Schiff', University of Florence, Florence, Italy.*
[d] *Department of Human Sciences for the Promotion of Quality of Life, University San Raffaele Roma, Rome, Italy.*
[e] *Laboratorio de Síntesis Orgánica, Departamento de Química Orgánica, Facultad de Química, Universidad de la República, Montevideo, Uruguay.*
E-mail: delfina@fq.edu.uy

Thematic Area: Supramolecular Chemistry

Keywords: fluoride chemosensor, aqueous anion sensing, polymeric sensors

Fluoride is extensively released into natural waters, leading to endemic fluorosis spreading worldwide [1]. This highlights the need for new low-cost and portable sensors capable of *in situ* monitoring of F^- ions. Unfortunately, achieving high levels of water compatibility and fluoride specificity remains a challenge. Here, four new urea-based discrete sensors were prepared and characterized. The sensors containing anthracenyl- (**5**) and 9H-fluorenyl- (**7**) signaling units exhibit intense luminescent emissions in DMSO, the former being particularly sensitive and selective to fluoride. In water, **5** displays a superior sensitivity (871 M^{-1}) and a detection limit (8 µM) below international guidelines, albeit with cross-sensitivity to $H_2PO_4^-$. To enhance the analytical performance, **5** and **7** were embedded into a fluoride-imprinted polymeric matrix to give solid-state sensors (**5P** and **7P**, respectively). **5P** shows remarkable sensitivity (360 M^{-1}) and anion specificity in water, with a low detection limit (35 µM) and a response linear range (118–6300 µM) encompassing the limit established by the United States Environmental Protection Agency (211 µM). Furthermore, **5P** also displays good reusability and recovery values in a real sample testing (101–106%), constituting the first example of a low-cost anion-imprinted polymeric probe tailored for the selective sensing of fluoride in aqueous samples.

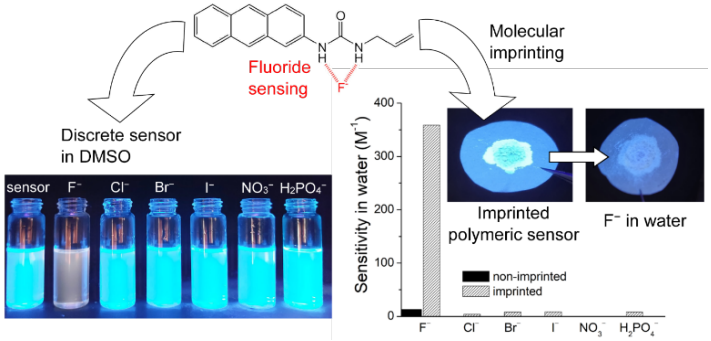

Figure 1. Compound **5** and polymer **5P** designed to sense fluoride in DMSO and aqueous samples.

Acknowledgments: PEDECIBA, CSIC and ANII (PhD grant POS_NAC_2020_1_164261).

References

[1] S. Srivastava and S. J. S. Flora, Current Environmental Health Reports, **7**, 140 (2020).