

Amphiphilic cyclodextrin microparticles versus post-emergence foliar herbicides

Gianluca Utzeri¹, Artur J.M. Valente¹

¹ CQC-IMS, Department of Chemistry, University of Coimbra, 3004-535, Coimbra, Portugal

gianlucautz@gmail.com

Bentazon and mecoprop, two highly water soluble post-emergence foliar herbicides, pose a serious threat to the environment and human health. They are applied to a wide range of crops, such as soybeans, peanuts and corn, acting as photosynthesis inhibitors. Herein, mesoporous amine rich α - and β -cyclodextrin microparticles are proposed as highly efficient sorbent materials towards bentazon and mecoprop. The click-imine synthesis strategy involves amine-cyclodextrin derivatives with different arm lengths (0, 6 and 12, where 0 denotes an amination at C6 position) reacting with glutaraldehyde as crosslinker. The physical and chemical properties of the mesoporous polymers were determined using a wide range of techniques, including FTIR, TG, CHNO analysis, potentiometric and inclusion complex titration, SEM, nitrogen adsorption and DLS. The sorbent capability was investigated by sorption isotherm for bentazon and mecoprop separately and in mixtures, achieving removal yields of approximately 97% and $\geq 99\%$ for bentazon and mecoprop, respectively. Quantification was performed by HPLC-DAD developing a new analytical method with LOD and LOQ of 0.013 and 1 mg L⁻¹. Nonetheless, sorption kinetic analyses and molecular dynamics simulations will be carry out to gain a deeper understanding of the interaction mechanisms at the polymer-pesticide interface.

Keywords:

Herbicides, amphiphilic-cyclodextrin, mesoporous polymer, sorption, environmental sustainability

References:

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Acknowledgements:

We acknowledge funding from the Coimbra Chemistry Centre – Institute of Molecular Sciences (CQC-IMS) which is supported by the Fundação para a Ciência e a Tecnologia (FCT), Portuguese Agency for Scientific Research. CQC is funded by FCT through projects UID/PRR/00313/2025 (<https://doi.org/10.54499/UID/PRR/00313/2025>) and UID/00313/2025 (<https://doi.org/10.54499/UID/00313/2025>) and IMS through special complementary funds provided by FCT (project LA/P/0056/2020 <https://doi.org/10.54499/LA/P/0056/2020>).