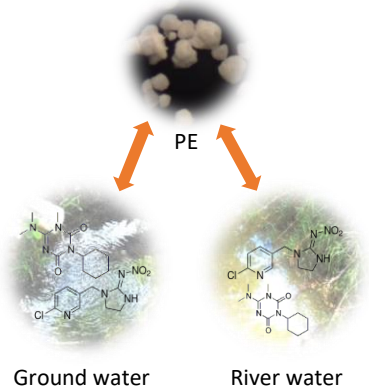
Interaction of polyethylene microplastics with imidacloprid and hexazinone

Theme 5 - "Priority" emerging pollutants in the hydrocycle: microplastics, nanomaterial, PFAs and PPCPs

UNESCO-IWRA ONLINE CONFERENCE 17-19 JANUARY 2023 3rd IN THE IWRA ONLINE CONFERENCE SERIES

1 Introduction

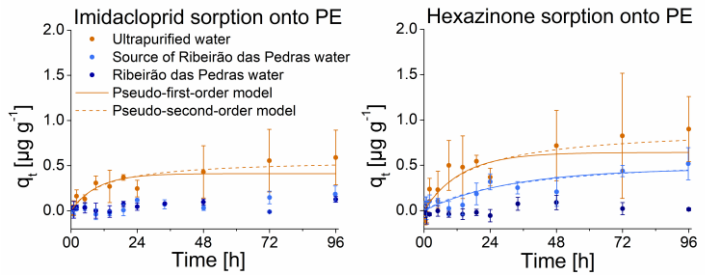
Microplastics (plastic particles <5 mm) are ubiquitous[1]. Imidacloprid and hexazinone are pesticides usually found in surface waters of agricultural activity areas[2]. We studied the interaction of polyethylene microplastic (PE) with both of these pesticides in ultrapurified and surface and ground water collected from a waterbody surrounded by sugarcane crops in Campinas, SP (Brazil) where these pesticides have been reported[3].



2 Sorption

Sorption kinetics experiments showed that sorption in ultrapurified water was higher than in groundwater (source of Ribeirão das Pedras) and river water (Ribeirão das Pedras).

Image: Google Maps (adapted)

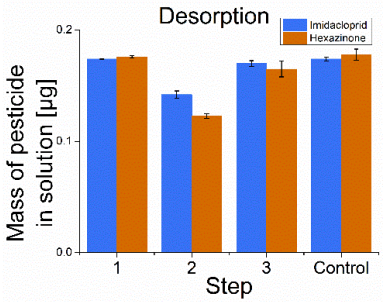


3 Desorption

Considering the sorption results and that microplastics may act as pesticides carriers, the following desorption experiment showed that once sorbed onto PE, imidacloprid and hexazinone can desorb when in contact with a more complex matrix.

Table 1. Desorption experiment

Step	Description
1	Mix of pesticides in ultrapurified water
2	Sorption onto PE for 96 h
3	Addition of Ribeirão das Anhumas water and mixing for 96 h
Control	Steps 1, 2 and 3 without PE



Policy Implications

An organic pollutant trace analysis may not be enough to conclude if a waterbody is safe. Microplastics may be "hiding" pesticides.

Table 2. Characterization of the matrices

Matrix	Ultrapurified water	Source of Ribeirão das Pedras	Ribeirão das Pedras	Ribeirão das Anhumas
TOC [mg L^{-1}]	0	8.3	12.6	14.5
pH	7.4	6.0	7.0	7.5

References

1 - Rochman, C. M. (2018). *Science* 360: 28-29.
2 - Acayaba, R. D. *et al.* (2021). *Environ Sci Pollut Res Int*. 28: 9824-9835.
3 - Santos, V. S. *et al.* (2022). *Environ Monit Assess.* 194: 637.

Acknowledgments

CAPES INCTAA FAPESP

Karen Noda Morishita, Vinicius Sarracini Santos, Camila Leite Madeira, Mariana Amaral Dias, Cassiana Carolina Montagner
Analytical Chemistry Department, Institute of Chemistry, University of Campinas, Campinas, São Paulo, Brazil
Contact: k171389@dac.unicamp.br; ccmonta@unicamp.br