



Adsorption of diclofenac and metronidazole on real microplastics of different nature and size

Macarena Munoz*, David Ortiz, Julia Nieto-Sandoval, Esther Gomez-Herrero, Zahara M. de Pedro, Jose A. Casas

Chemical Engineering Department, Universidad Autónoma de Madrid, Campus de Cantoblanco, 28049, Madrid, Spain

Introduction

Microplastics (MPs) have been recognized as **pollutant carriers** in the aquatic environment



Main challenges of adsorption studies:

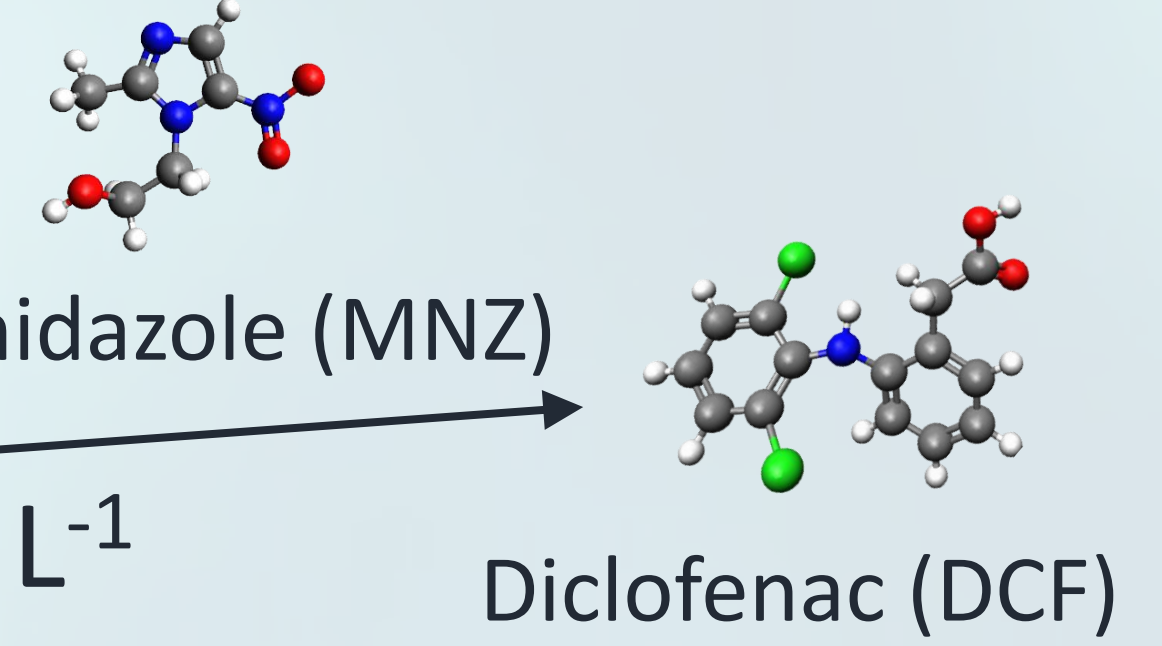
- ⊕ Lack of works with **real MPs** Pure polymers Real MPs
- ⊕ Unclear role of **MPs nature, size and age**
- ⊕ **Desorption** of adsorbed pollutants not evaluated

Experimental

Adsorption experiments

Thermostatic shaker bath

- VOLUME: 1.5 mL
- TEMPERATURE: 25 °C
- SHAKING RATE: 200 rpm
- pH: natural (~7)
- [Micropollutant]₀ = 0.5 – 15 mg L⁻¹
- MP DOSE: 10 mg
- Micropollutant analysis: HPLC-UV



Obtention of microplastics

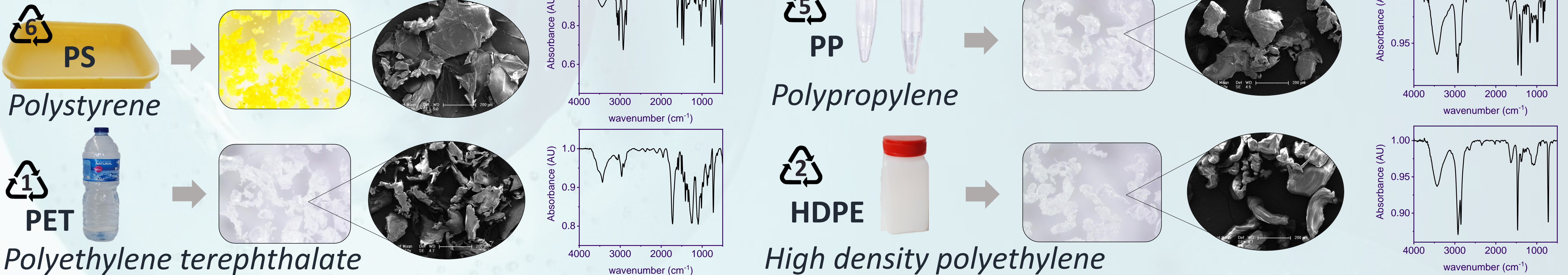
Cryogenic grinding

Size range: 20 – 1000 μm

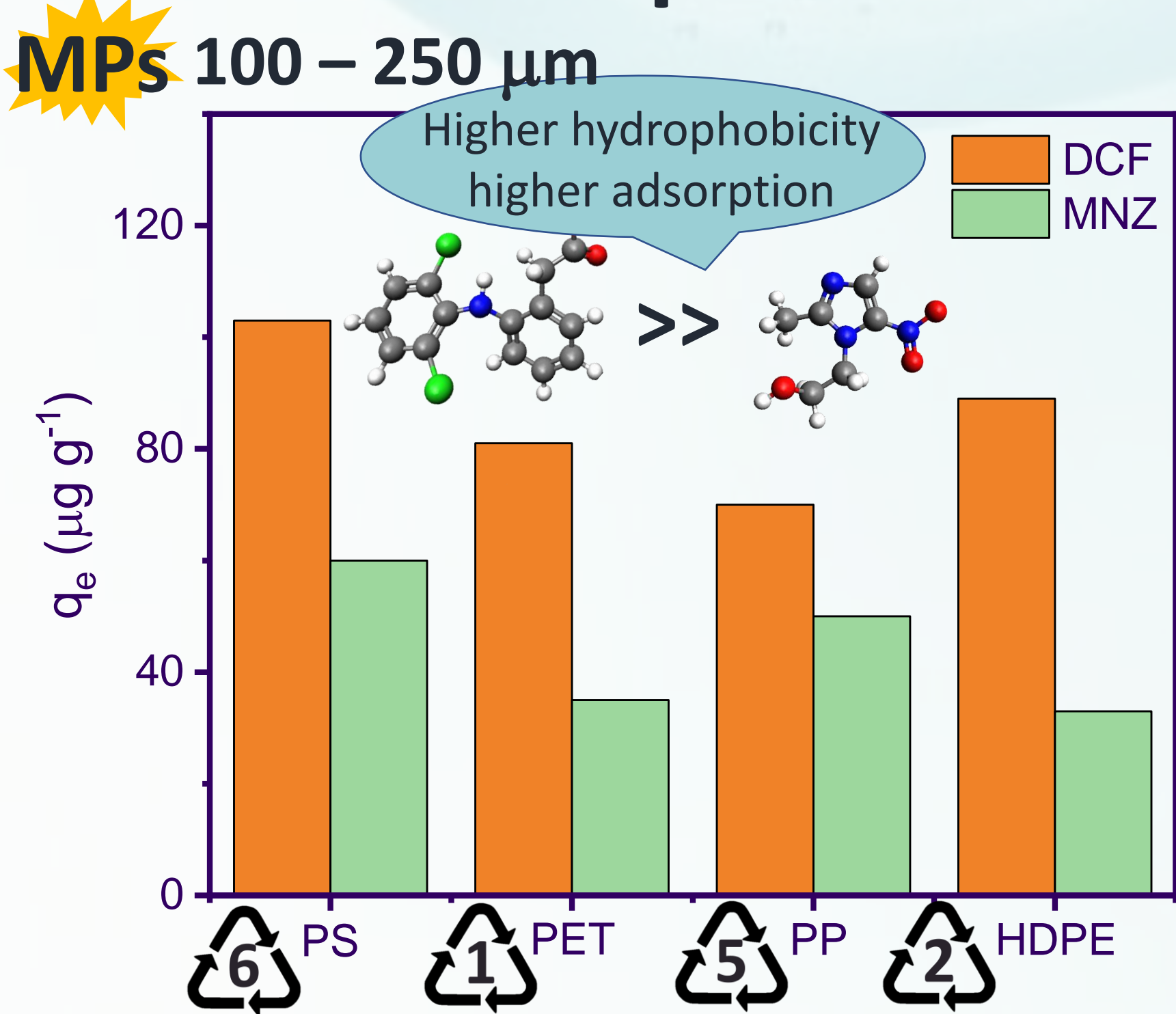


Results

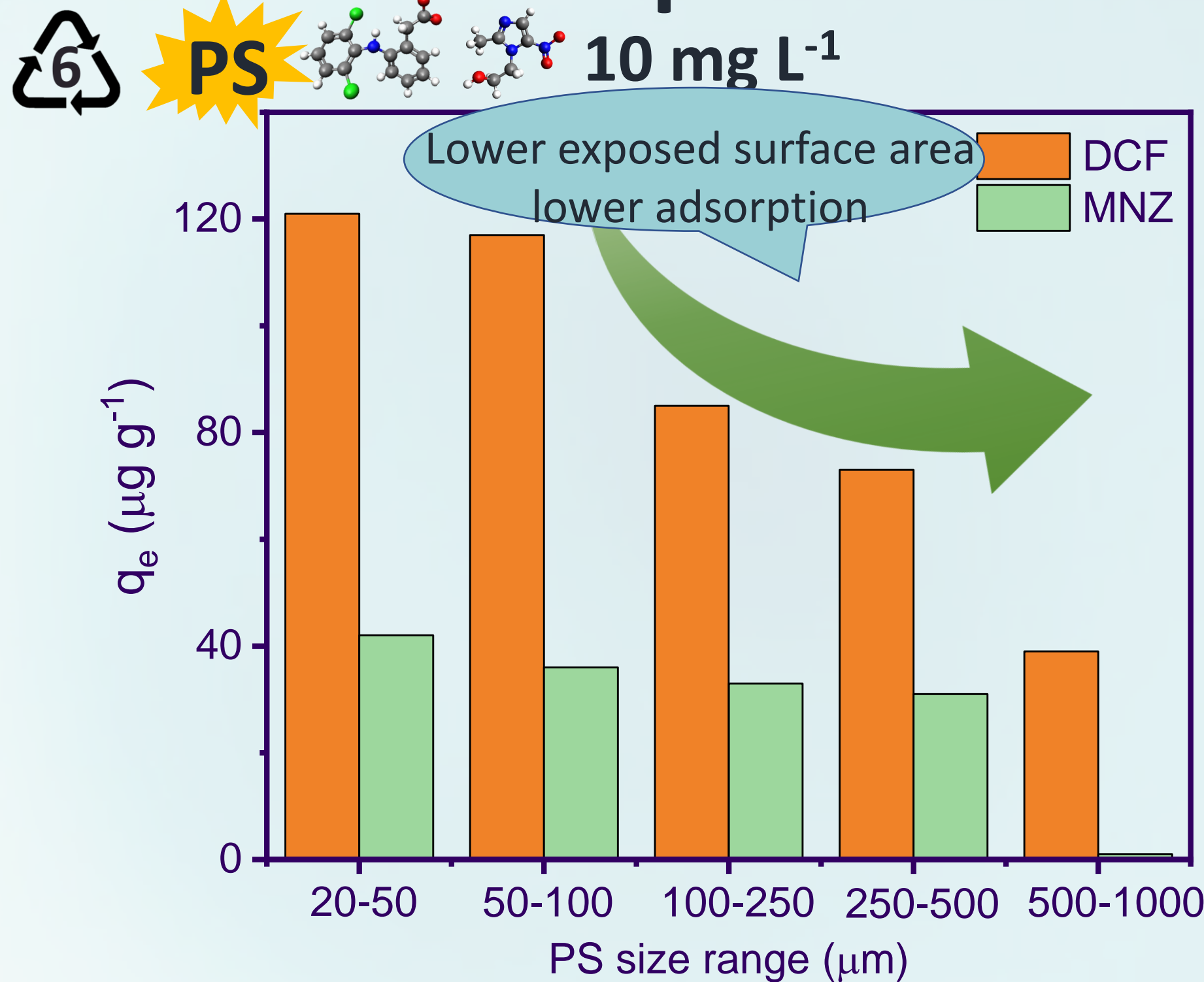
MPs characterization



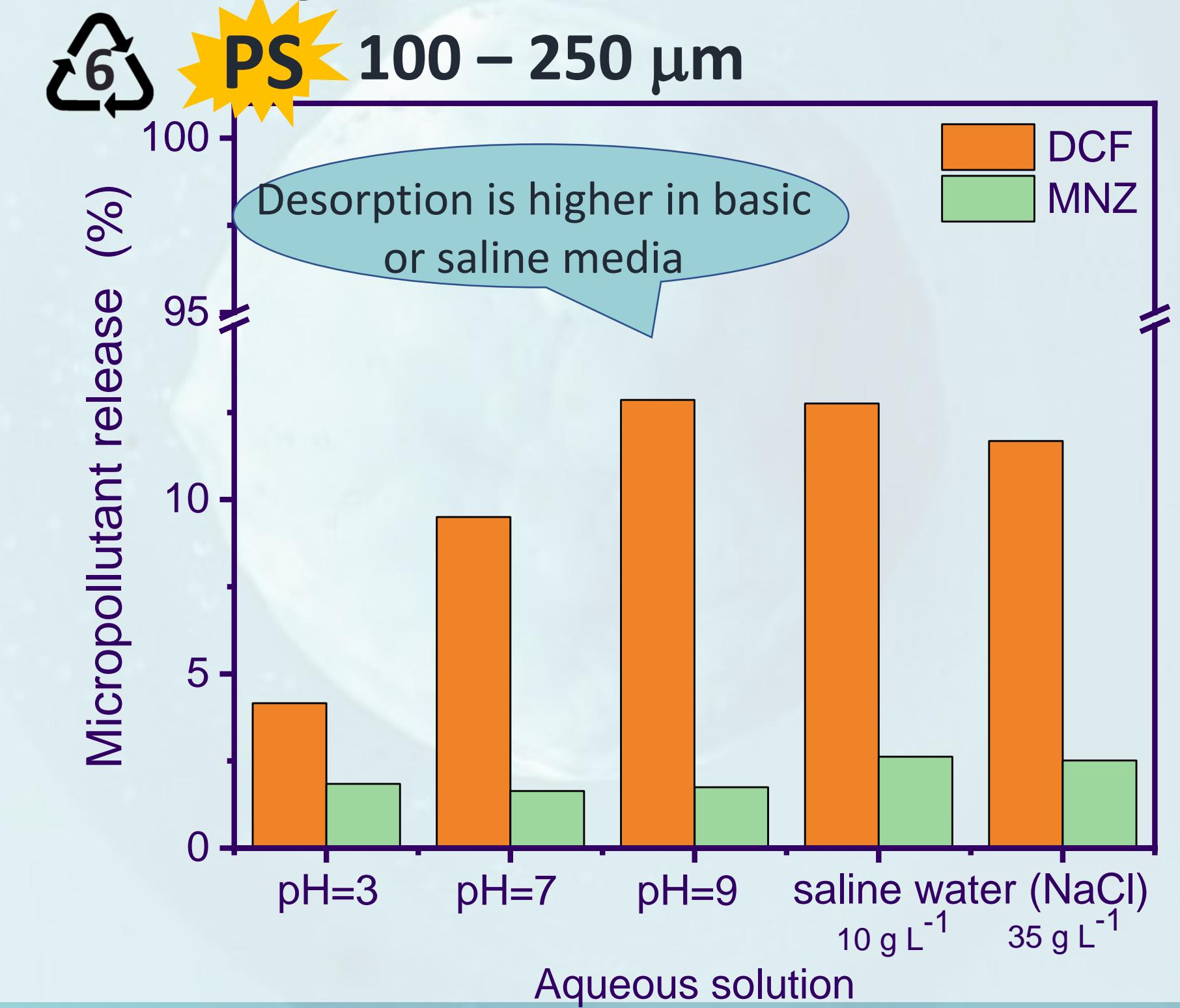
Effect of microplastic nature



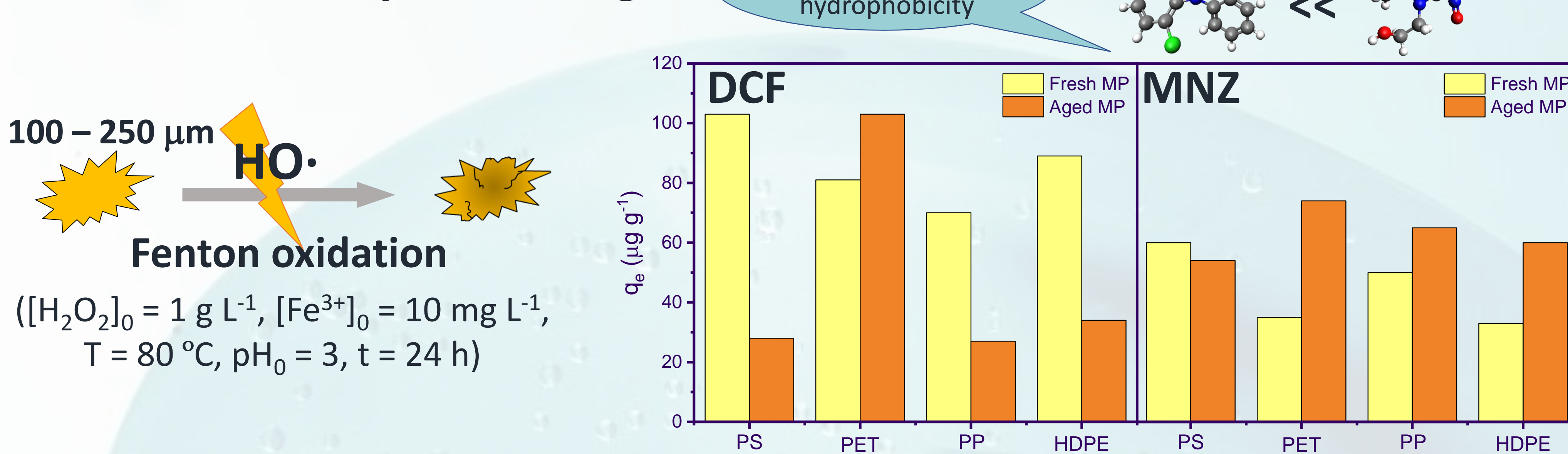
Effect of microplastic size



Desorption



Effect of microplastic "age"



Conclusions

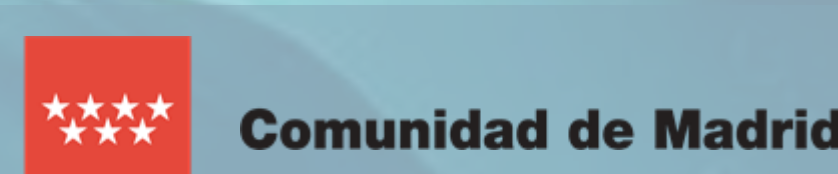
- The **higher hydrophobicity** of the micropollutants, the **higher adsorption** onto MPs regardless of their nature.
- **Adsorption capacity** increases with **increasing the MPs exposed area**.
- **Desorption** of adsorbed pollutants is favored in **basic and saline media**.
- **MPs oxidation** increases their **hydrophilicity** and thus, the adsorption of hydrophilic pollutants.

References:

[1] Li, J. et al., Water Res. 137 (2018) 362-374.

[2] Ateia, M. et al., Sci. Total Environ. 720 (2020) 137634.

Acknowledgements:



This research has been supported by the Autonomia University of Madrid and Community of Madrid through the project S11-PJI-2019-00006, and by the Spanish MINECO through the project PID2019-105079RB-I00. M. Munoz thanks the Spanish MINECO for the Ramón y Cajal contract (RYC-2016-20648). J. Nieto-Sandoval thanks the Spanish MINECO for the FPI predoctoral grant (BES-2017-081346). D. Ortiz thanks the Spanish MIU for the FPU predoctoral grant (FPU19/04816).