SCI 2024
Chemistry
ELEMENTS OF FUTURE
XXVIII National Congress
MILANO,
26 - 30 August 2024
Società Chimica Italiana

**ANA-OR-033**

# Microplastics as vehicles for toxic metal ions: an adsorption study

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The widespread occurrence of plastic waste in aquatic environments and its impact on animals and humans health is a major topic of scientific research worldwide[1,2]. Plastics and bioplastic polymers dispersed in the environment undergo several degradation processes, resulting in significant changes in their morphological properties and in their very small particle sizes. Of greatest concern to the scientific community is the fact that so-called microplastics (MPs), *i.e.* polymeric particles with a diameter below 5 mm, enter in the food chain and can accumulate in the tissues and organs of humans and animals[1,2]. The hazard of MPs is highlighted by its ability to adsorb pollutants from the surrounding aquatic environment, making it a vehicle of toxic substances[2,3]. In this work we report the adsorption of $Pb^{2+}$ ions on MPs of polystyrene (PS), of PS functionalized with carboxylic groups (PS-COOH) and of polylactic acid (PLA). The adsorption capacity of MPs toward $Pb^{2+}$ ions were investigated at different experimental conditions, i.e. in water, in $NaNO_3$ or NaCl 0.1 mol $L^{-1}$ and with small amounts of the surfactant sodium dodecyl sulfate (SDS). Atomic spectroscopy and voltammetry were used to determine the concentration of $Pb^{2+}$ ions. Electrochemical impedance spectroscopy (EIS), scanning electron microscopy with energy dispersive X-ray analysis (SEM-EDX), ξ-potential and FT-IR measurements were performed to evaluate the mechanism of $Pb^{2+}$ ions adsorption onto MPs. The results show that the adsorption capacities of MPs towards $Pb^{2+}$ ions vary from a few hundred μg $g^{-1}$ to a few mg $g^{-1}$ as function of experimental conditions of aqueous suspensions.

**Acknowledgements:**
The authors acknowledge the support of the NBFC to the University of Palermo, funded by the Italian Ministry of University and Research, PNRR, Missione 4 Componente 2, "Dalla ricerca all'impresa", Investimento 1.4, Project CN00000033.

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