ACADEMIC POSITIONS

JOB DESCRIPTION

- **JOB TITLE/PROFILE**
  PhD position on the Experimental Characterization of the Sea-to-Atmosphere Transfer of Micro- and Nanoplastics and related Photo-Reactivity

- **RESEARCH FIELD(S)**[1]
  Environmental Sciences

- **JOB DESCRIPTION**
  The Ocean Sciences Institute with A*midex is funding a 3 years PhD position 36 month position to contribute to the BubblePlast project supported by ANR (collaborative research project).
  Micro- and nanoplastics (MNPs) contaminate all environmental compartments, even in the most remote regions of the world.[1-5] The oceans and atmosphere, through their global circulation systems, are the most likely to disseminate them on such a worldwide scale. Recent literature starts to draw a dynamic picture in which the oceans are no longer seen as a definitive sink and the ocean atmosphere exchanges are likely to play a major role in these long-range transports.[6,7]
  This PhD will focus on the transfer of MNPs from the oceans to the atmosphere. This transfer will be studied experimentally using a simulation chamber specially developed internally.[8,9] When plumes of air bubbles generated by breaking waves burst at the ocean surface, sea spray aerosols (SSAs) are produced.[10] We will investigate how this well-known and large-scale phenomenon is able to transfer MNPs into the atmosphere.[11] We will start by estimating realistic fluxes of model MNPs. We will then refine our knowledge of the underlying processes by looking at the influence of several parameters: size, shape, buoyancy, and degree of ageing of the MNPs, chemical composition and temperature of the seawater, nature of the surface microlayer. We will also look at the mixing state of transferred MNPs with other SSAs components. This work will provide data for the parameterization by other teams of a "marine source" function for MNPs in atmospheric transport models. A second part of the thesis will focus on the interactions of MNPs with the other components of the environments of interest,

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i.e. marine surface water and SSAs: do they participate in the atmospheric transfer of other marine contaminants?[12,13] Do they produce reactive oxygen species (ROS)? Does this reactivity affect the fate of their co-contaminants?[14]

This PhD is part of the ANR BubblePlast project (2023-2027). The PhD student will carry out experiments in a simulation chamber and in a photochemical reactor. He/she will have at his/her disposal a wide range of instruments for studying the size distribution of the generated SSAs (SMPS, optical counter, cascade impactor) and for the physico-chemical analysis of the SSAs and transferred MNPs (Pyrolysis-GC-MS; HPLC-ESI-Orbitrap MS; ICP-MS, IRTF microscopy; electron microscopy). Field trips are planned to collect seawater samples.

Bibliography

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- **QUALIFICATIONS/SKILLS/EDUCATION & RESEARCH REQUIREMENTS**

We are looking for a French or international Master 2 student or final year of engineering school or equivalent (graduated before fall 2024) in the fields of physico-chemistry of aerosols and/or atmospheric sciences and/or environmental physico-chemistry. The candidate must be ranked in the first third of their M1 promotion without nationality criteria.

Scientific knowledge and skills

- Practical (or at least theoretical) knowledge of the physico-chemistry of atmospheric aerosols and organic and metallic micropollutants
- Practical knowledge (or at least theoretical) of the following chemical analysis techniques: gas chromatography, liquid chromatography and mass spectrometry
- Great appetite for experimental work

Communication and project management skills

- Fluency in English (written and oral)
- Mastery of bibliographic research and excellent writing skills
- Ability to adapt and work on a collaborative research project (ANR BubblePlast)
- Ability to manage research projects independently, including planning, execution and timely completion

- **APPLICATION DEADLINE**

1st of May 2024. International candidates are encouraged to apply.

- **STARTING DATE**

The position is available for 6 months ideally starting in October 2024

- **JOB LOCATION**

Laboratoire de Chimie de l'Environnement, UMR CNRS 7376, 3 place Victor Hugo, 13003 Marseille, et Europôle de l'Arbois, Bât. Villemin, 13545 Aix-en-Provence

- **REQUESTED DOCUMENTS OF APPLICATION**

Letter of motivation, CV and 2 reference letters.

- **CONTACT TO APPLY**

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