

Detecting nanoplastics from sea water using microscopic methods

Arto Hiltunen¹, Joonas Huopala², Pia Damlin², Sirkku Häkkinen¹ & Jari Hänninen¹

¹Biodiversity Unit of the University of Turku

²Department of Chemistry, University of Turku



Background

Micro- and nanoplastics have raised a serious environmental and health concerns.¹ While the means to study microplastics are well established, the methodology to study nanoplastics is still under development. In particular, there is a lack of microscopic methods that would provide us with images of the nanosized plastic particles.²

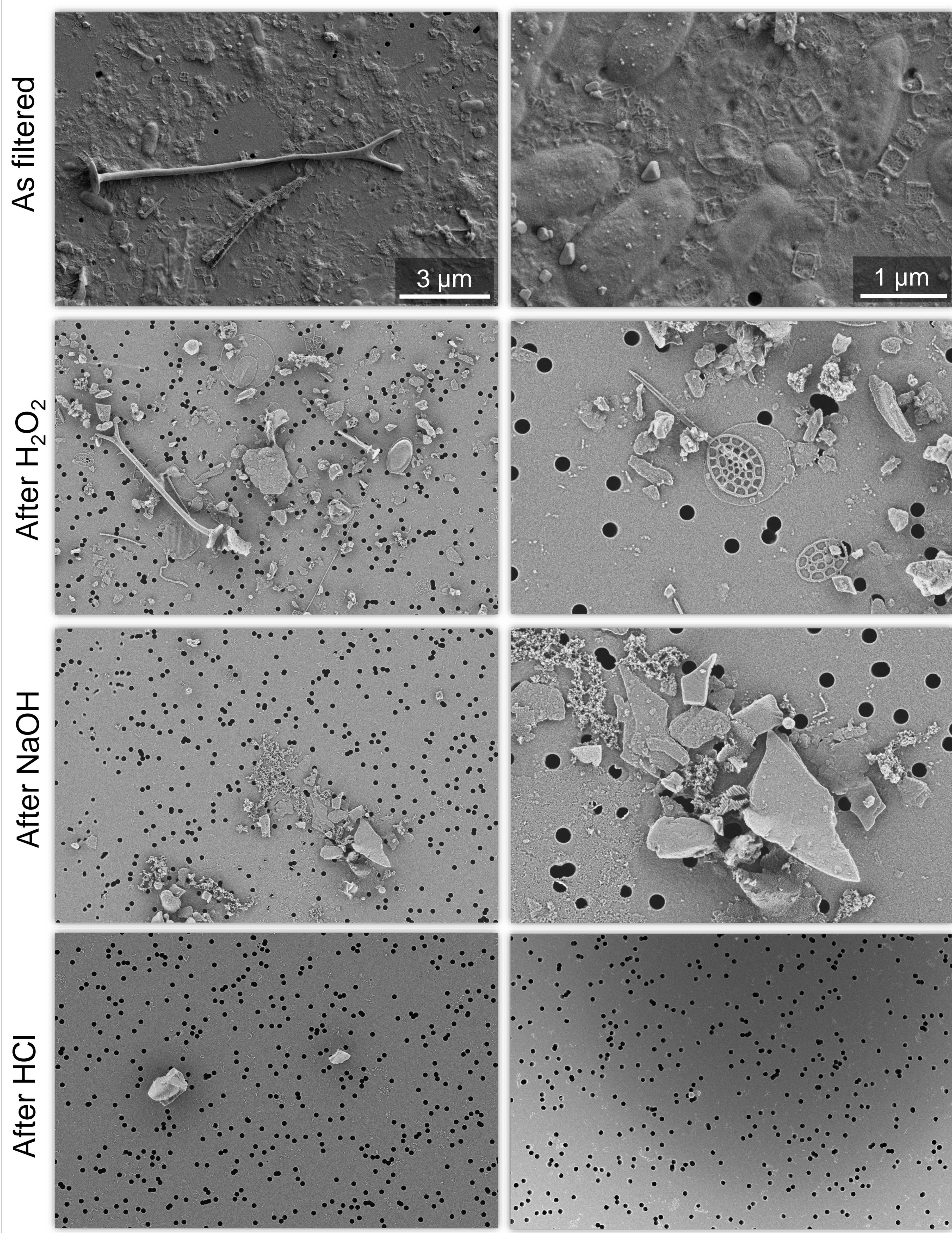
Results

In order to take good images of the nanoplastics, the sample (here seawater) needs to be purified from everything else than the plastic. An untreated sample will contain bacteria, plankton and algae large enough to cover the nanosized plastic particles.

Figure 1 shows how the successive sample treatment with H₂O₂, NaOH and HCl will leave a clean sample behind with only some particles left that can be tested whether they are plastic. Scale is the same in each column.

Figure 2 shows a particle found in a water sample purified according to the above described method. EDS mapping confirms that the particle is made of carbon. Further investigations with Raman spectroscopy suggests that the particle might be polystyrene.

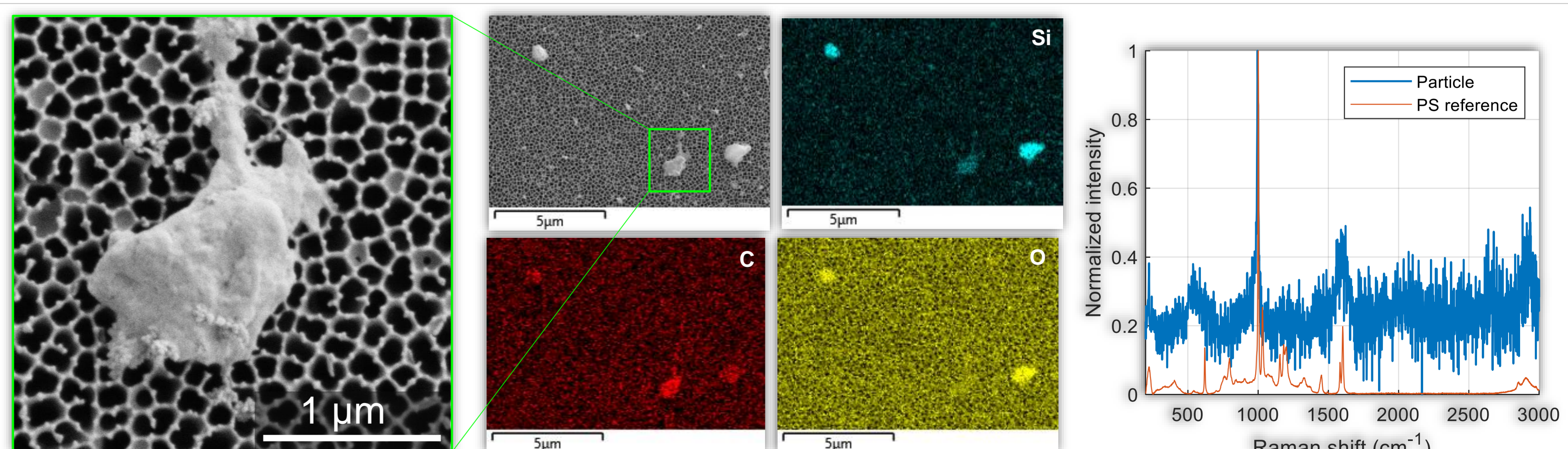
Figure 1



Conclusions

A protocol allowing the microscopical investigation of nanoplastic particles from sea water samples was developed. Verification of the results is ongoing in our laboratory.

Figure 2



References

- [1] Lim, X. Z. *Microplastics are everywhere - but are they harmful?* Nature 593, 22–25 (2021).
- [2] Mandemaker, L. D. B. & Meirer, F. *Spectro-Microscopic Techniques for Studying Nanoplastics in the Environment and in Organisms*. Angewandte Chemie International Edition 2022, e202210494 (2022).

Acknowledgements

The study has utilized research infrastructure facilities provided by FINMARI (the Finnish Marine Research Infrastructure consortium). Weisell-foundation is gratefully acknowledged for funding.