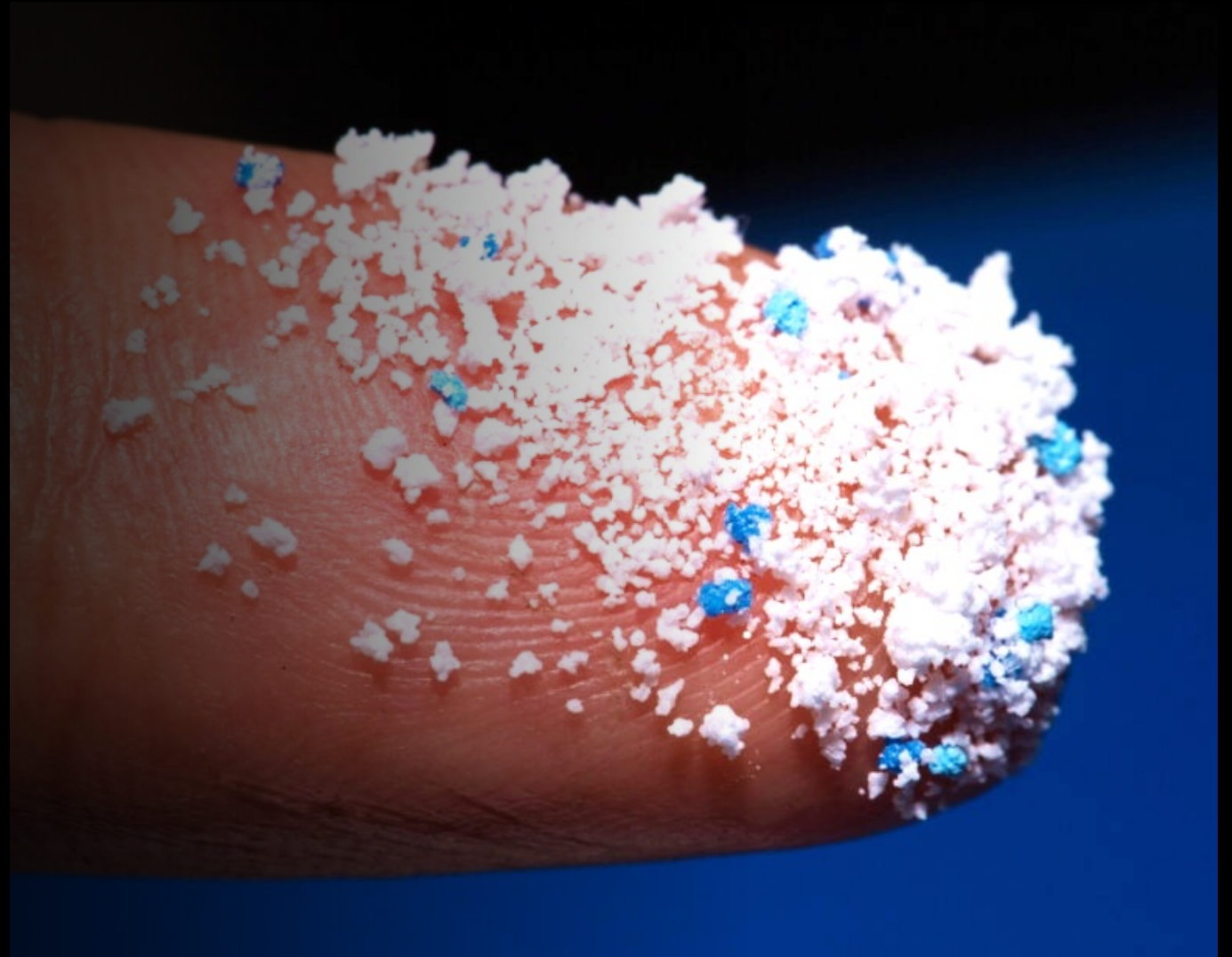




10 Sources of Microplastics from Geosynthetics and Suggested Mitigation Strategies

www.excelplas.com

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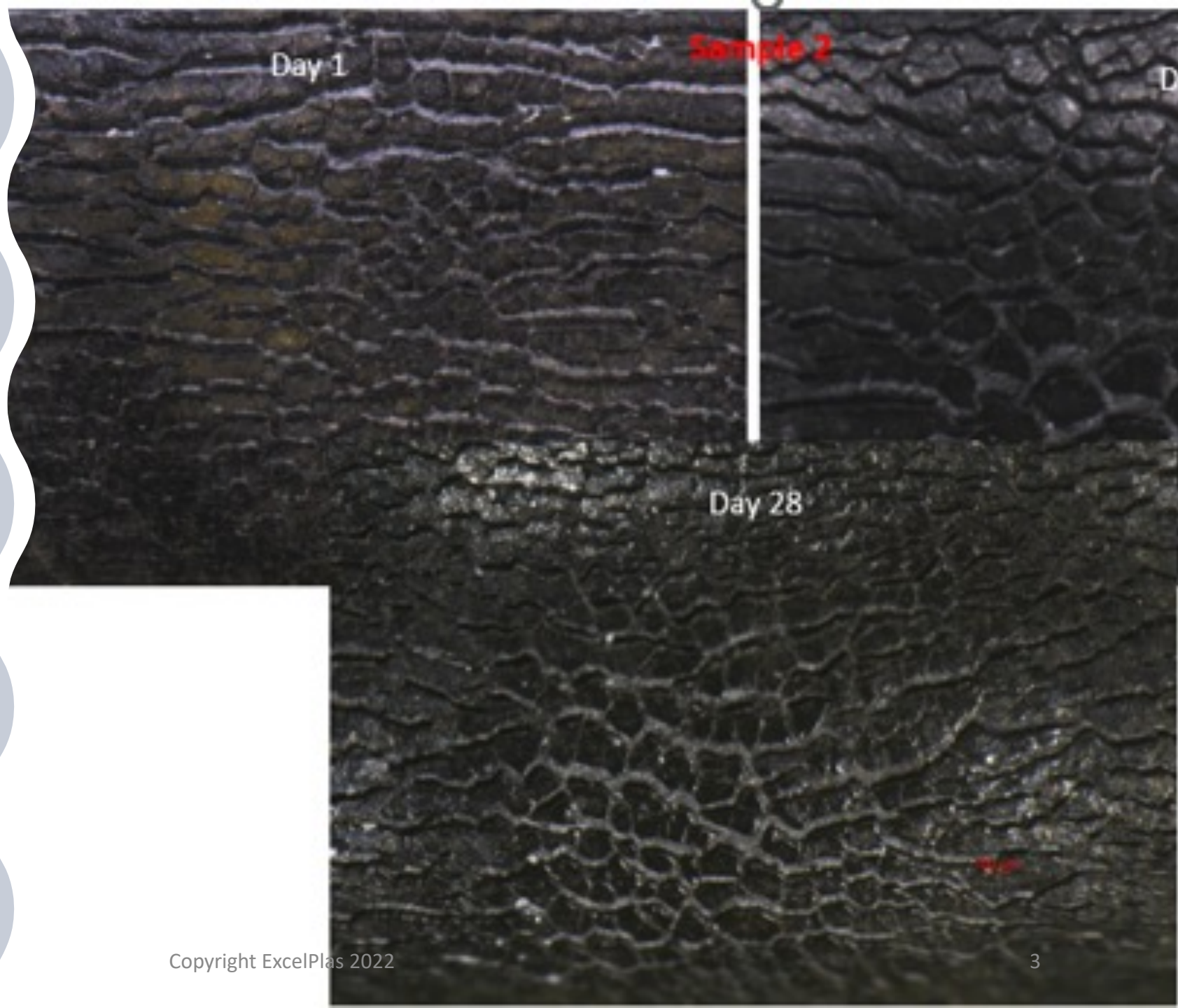


Introduction

- Geosynthetics are not a significant source of microplastics, particularly when compared to other more direct and higher quantity sources.
- European Commission (EC) data estimates that vehicle tyres and road markings (55%), resin pellets (28%) and clothing textiles (8%) account for the majority of microplastics in marine environments.
- Nevertheless it is self-evident that if you put huge quantities of geosynthetic products into the environment in sometimes very harsh conditions, the erosion and abrasion they're subjected to as well as oxidative degradation will lead to microplastics release.
- This study by ExcelPlas has shown the geosynthetics can release microplastics into the environment by 10 liberation mechanisms.

Chlorine Oxidation of PE Liners

Mitigation: ensure high levels of
protective stabilizers against
chlorine oxidation



Chloramine Attack on fPP

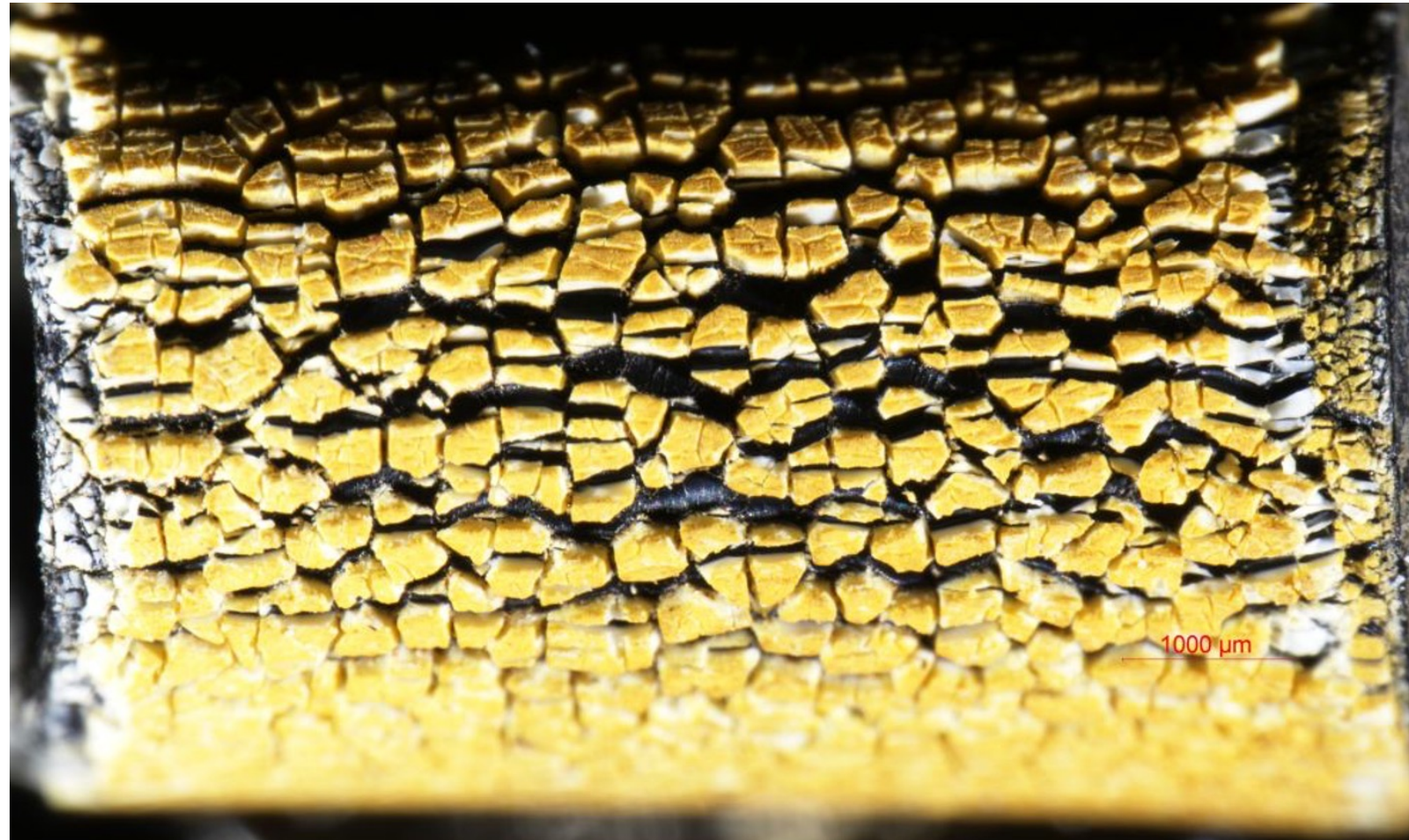
Chloramine
Exposure
of
Polypropylene
Liners (tea-leaf
delamination)

Mitigation: do not use fPP or
RPP for chloramine applications



UV Exposure of White HDPE Liners

Mitigation: ensure white layer of HDPE geomembrane is properly stabilized and contains metal deactivator additives



Abrasion of Geotextiles in the Marine Environment

Mitigation: ensure use of high-quality Geotextile Sand Containers (GSC) such as Elcorock™/GeoRock™.



Source: Lopazanski 2016) (Courtesy NC Department of Environmental Quality, Division of Coastal Management)

Fretting of Geogrids

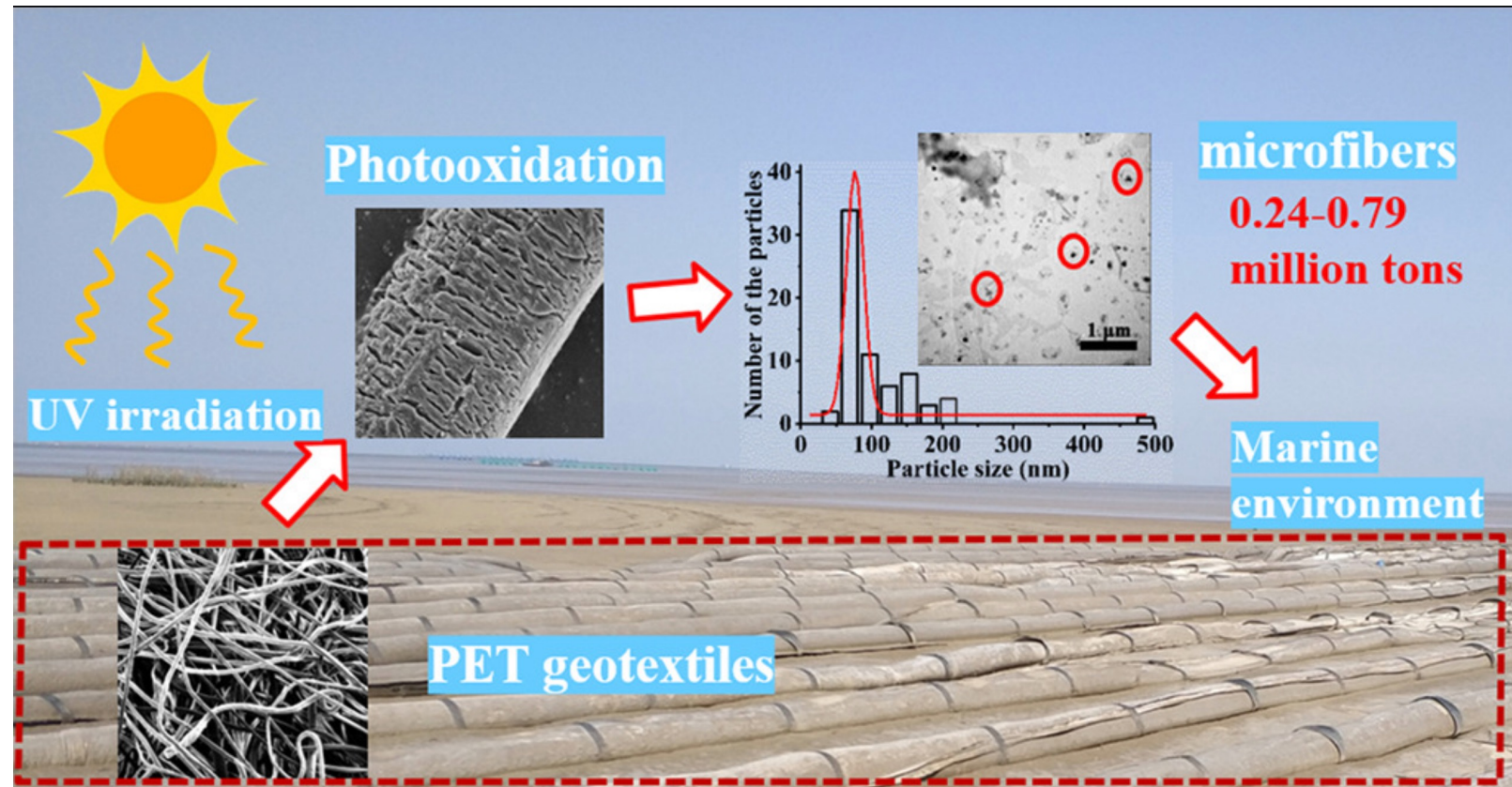
Mitigation: ensure design prevent excessive fretting and rubbing.



UV Photo-Degradation of PP Geotextiles

Mitigation: ensure PP geotextile are properly stabilized against UV degradation using Chimassorb 944 or Chimassorb 2020.

Ref. J. R. Carneiro et. al. , *Degradation of Polypropylene Geotextiles with Different Chemical Stabilisations in Marine Environments* *Construction and Building Materials*, 165, 877 (2018).



Source: Bai, X. et. al. *Weathering of Geotextiles Under Ultraviolet Exposure: A Neglected Source of Microfibers from Coastal Reclamation*, *Science of the Total Environment*, 804, 150-168 (2022).

Shearing and Puncturing of Geotextiles by Sediment Grains

Mitigation: ensure design prevents excessive shearing and puncturing.

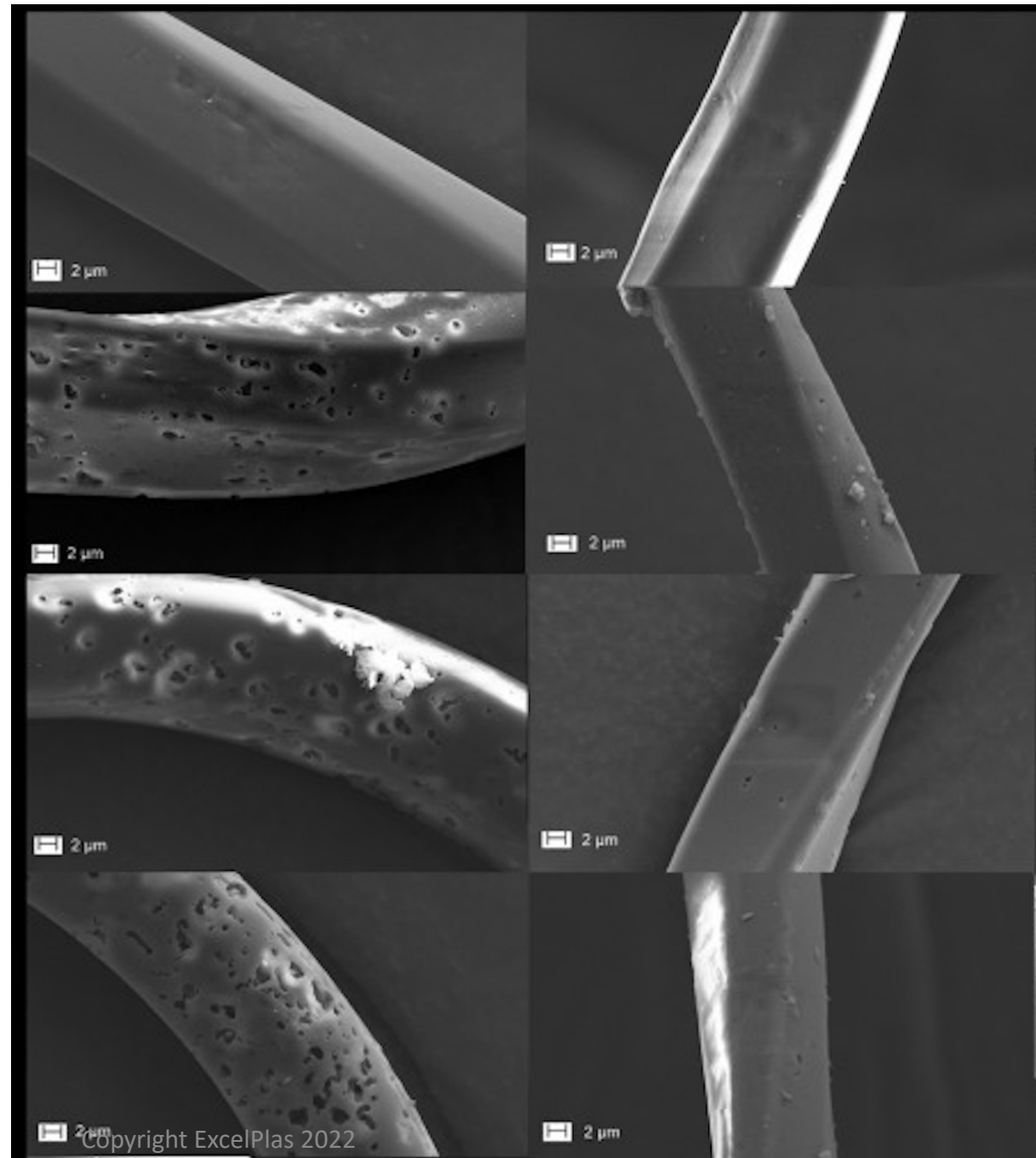


Contamination of the Shore of the Southeast Baltic (Kaliningrad Oblast, Russia) with the Debris of Geosynthetic Materials for the Survey Period 2018 - 2020

Contributors: Alexander Kileso, Boris Chubarenko, Elena Esiukova, Vasily Pinchuk and Franz-Georg Simon

Alkaline Hydrolysis of Polyester Geotextiles

Mitigation: ensure low
carboxylic acid numbers and
avoid high pH contact



Attrition and Comminution of EPS Geofoam and Dissolution by Fugitive Fuels

Mitigation: wrap geofoam with
protective liner



Disc Grinding of Geomembrane Prior to Extrusion Welding



Mitigation: Geomembrane installers need to use suction shrouds to capture grinding dust



*Disk grinder and diamond cup are sold separately.

ExcelPlas has developed specialized techniques to separate, isolate and identify microplastics in sediments, waste water and potable water.