

EFFECTS OF MICROPLASTICS FROM CIGARETTE FILTERS ON TERRESTRIAL AND AQUATIC INVERTEBRATES

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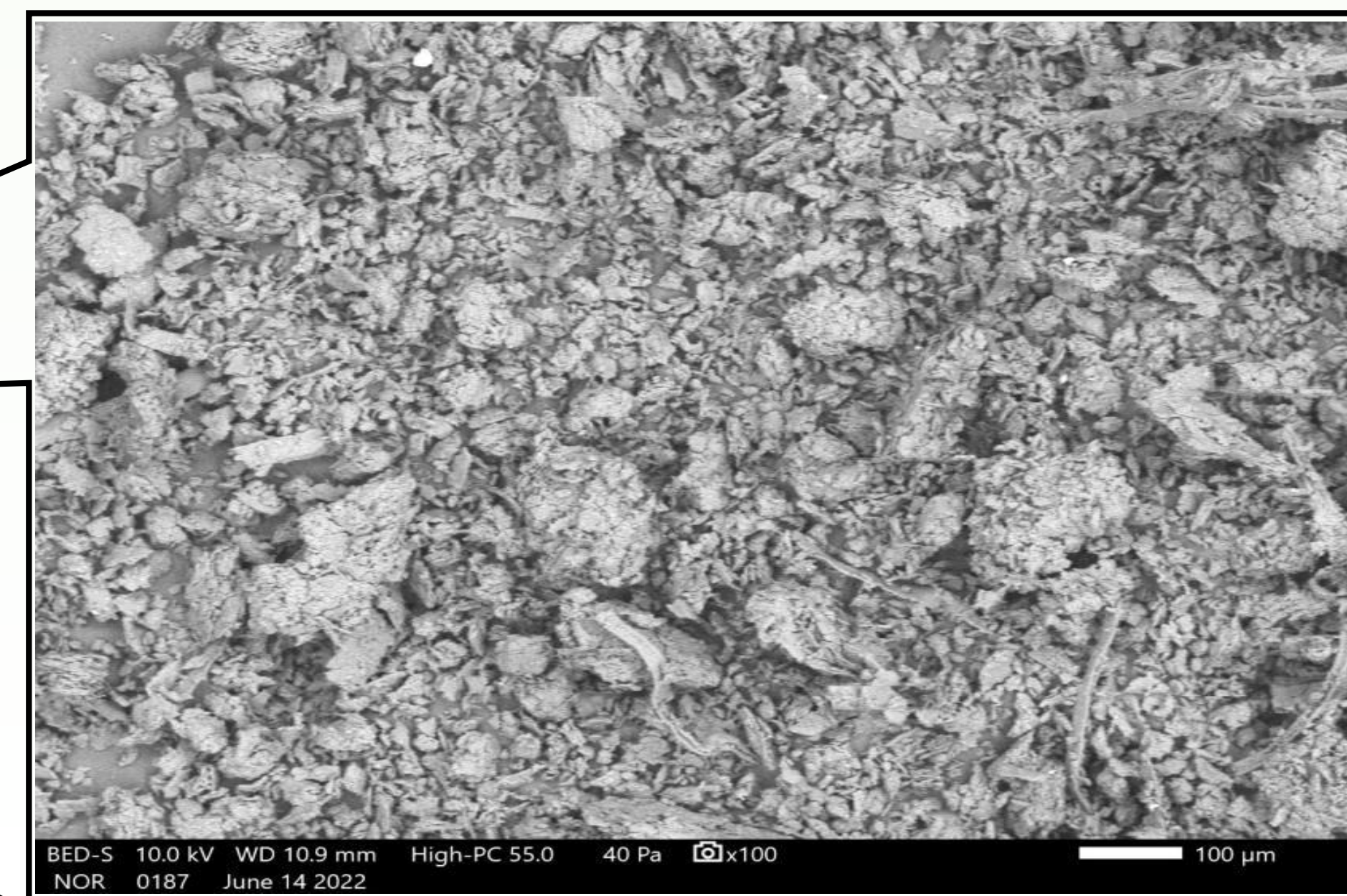
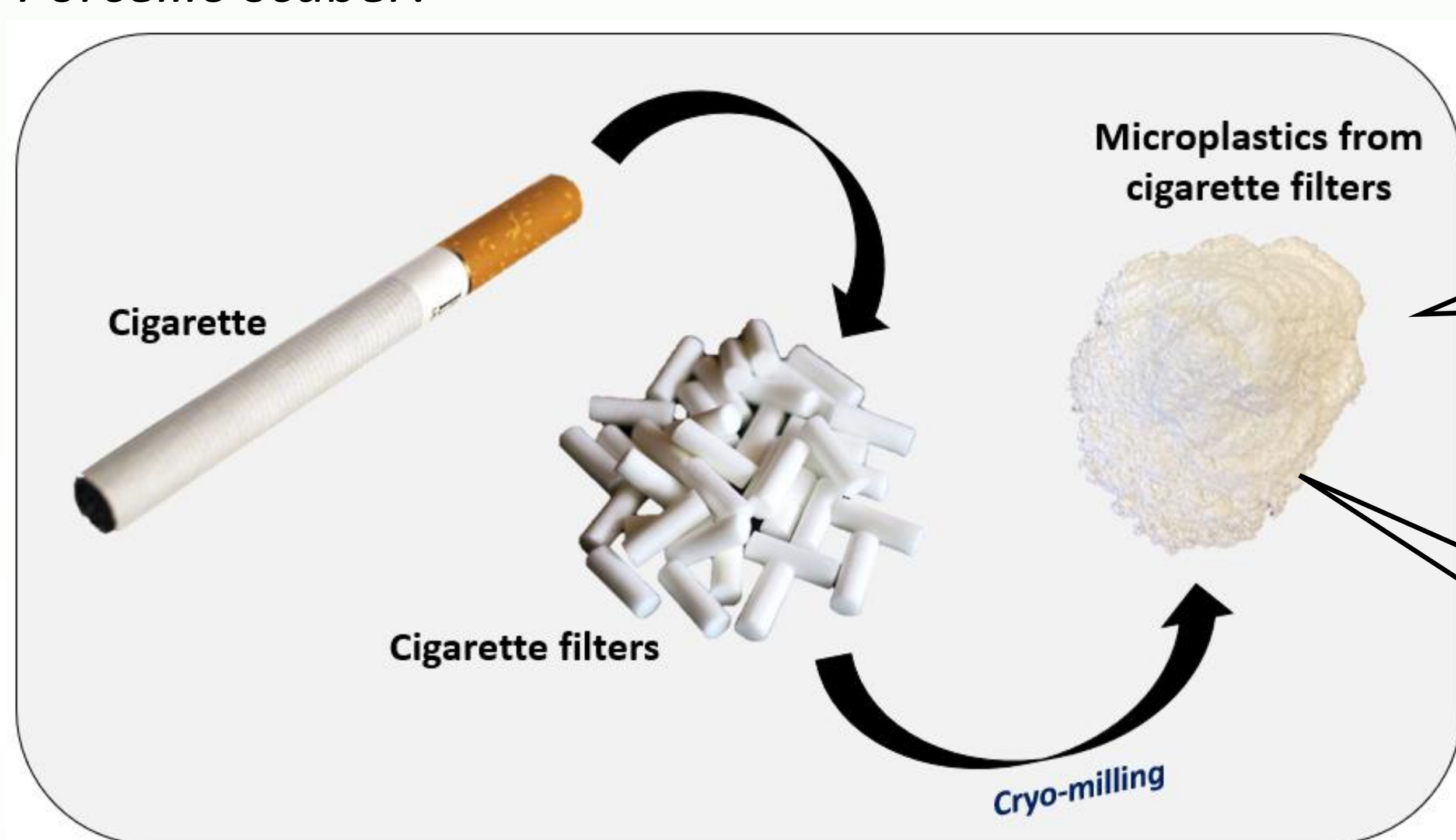
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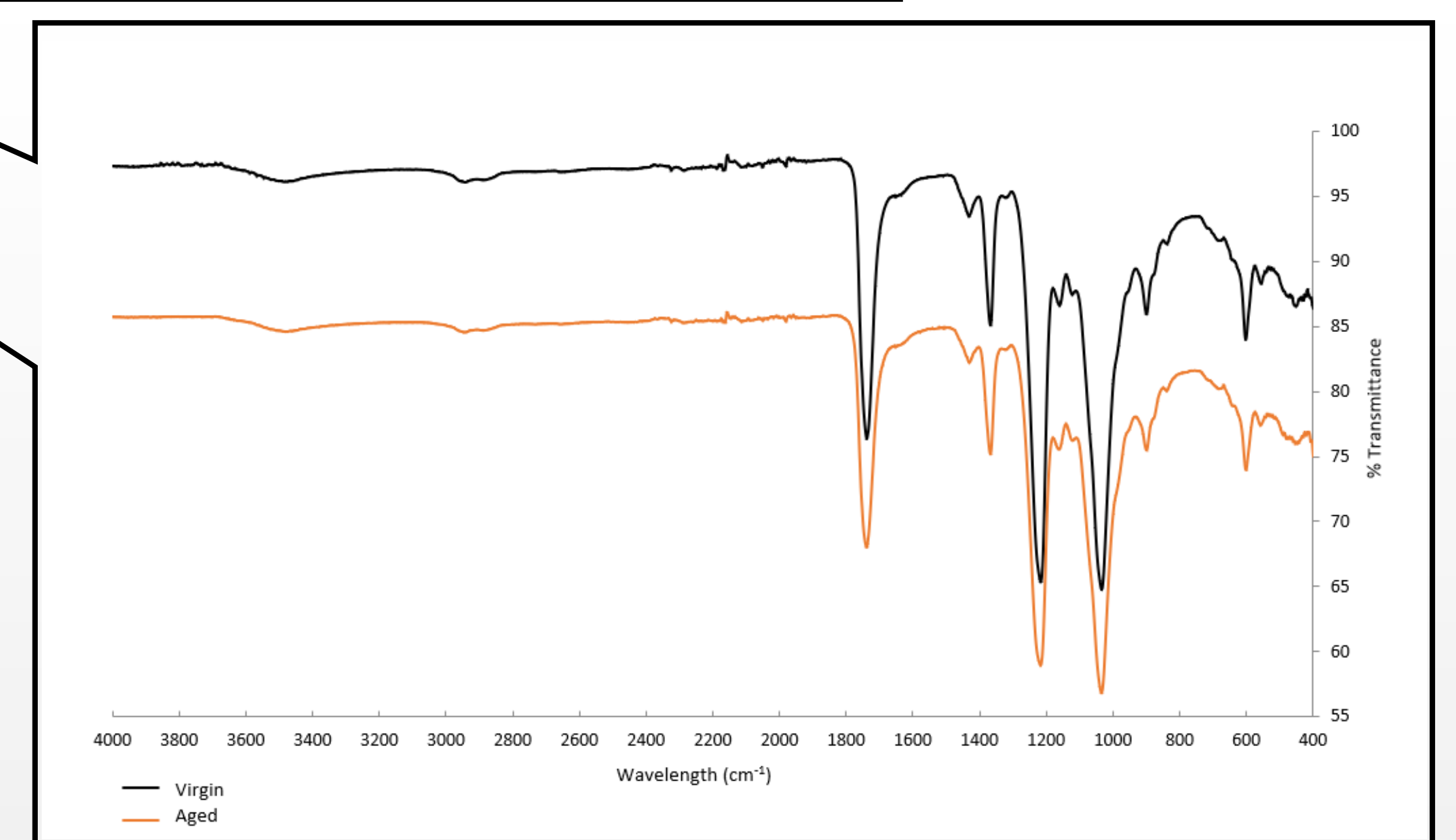
INTRODUCTION

Cigarette filters (butts) are one of the most abundant form of anthropogenic litter. Once disposed into the environment, they are subjected to weathering (UV radiation, rain, moisture, etc.) and mechanical influences (abrasion, fraction, etc.). During this process nano- and microplastics are formed.

The aim of this study was to prepare cellulose acetate-based microplastics, produced by grinding non-used cigarette filters, and to evaluate the effects on freshwater crustacean *Daphnia magna*, mealworm larvae *Tenebrio molitor*, and terrestrial crustacean *Porcellio scaber*.



SEM analysis



METHODS

Microplastics from non-used cigarette filters were produced by cryo-milling using Millmix 20 (Domel Holding, d.d.) and further sieved (<250 μm). Obtained microplastic was also aged under UV irradiation, according to the standard EN ISO 4892-2:2013, which specifies test conditions for replicating the weathering effects on plastic materials by xenon arc light in an accelerated weathering chamber. Characterization of aged and virgin (non-aged) microplastics was performed by FTIR analysis and scanning electron microscopy (SEM).

Survival of the freshwater crustacean *D. magna* was tested in the case of exposure to aged and virgin cellulose acetate-based microplastics from cigarette filters, while changes in energy-related traits and immune status were studied in mealworm larvae *T. molitor* and terrestrial crustacean *P. scaber*, respectively.

RESULTS

Daphnia magna:

- No change in survival after exposure to virgin and aged microplastics from cigarette filters.

Porcellio scaber:

- 7-day exposure to virgin microplastics at concentrations of 0.06% and 0.5% w/w per dry soil slightly altered the immune processes of *P. scaber*, as evidenced by a decreased total haemocyte count. No other changes (ratios between different cell types) in immune parameters were observed.
- After 14-day of exposure, measured immune related parameters in the haemolymph returned back to the normal level.

Tenebrio molitor:

- Increased activity of electron transfer system (ETS) at 0.5% w/w after 14-day exposure to virgin microplastics, while no change was observed in protein, carbohydrate and lipid content.

CONCLUSIONS

Research findings suggest no adverse effects of aged or virgin cellulose acetate-based microplastics from cigarette filters on freshwater invertebrates, while virgin microplastics altered some physiological/metabolic activities in terrestrial invertebrates, but no serious adverse effects were observed under the conditions tested.

