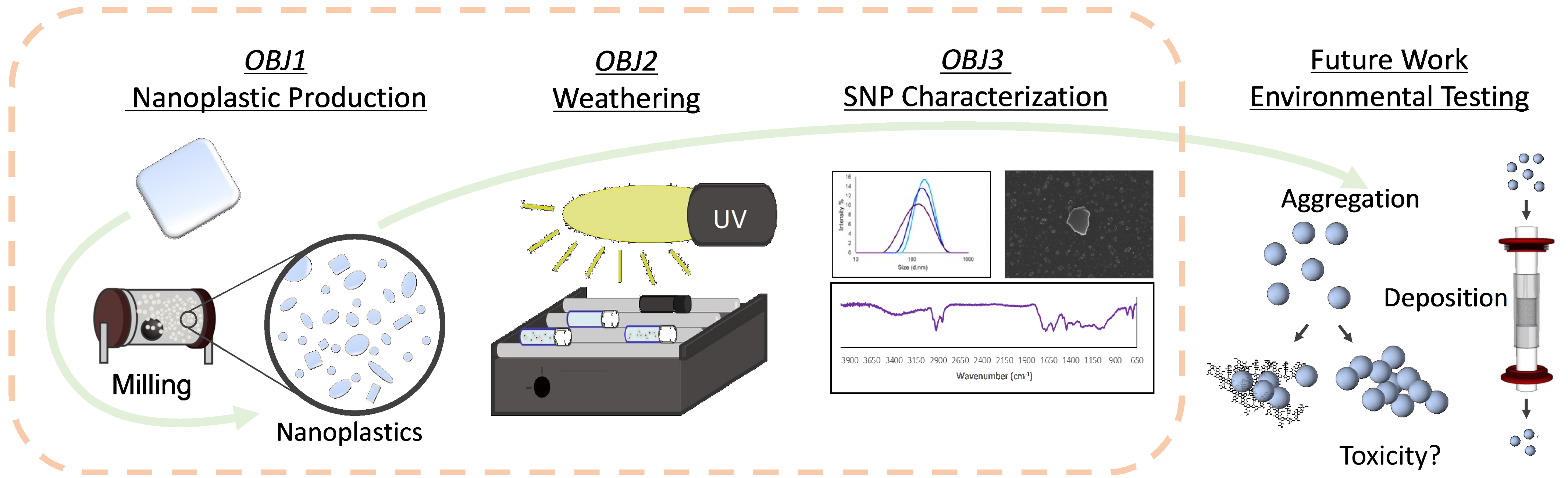


Production of Weathered, Secondary Nanoplastics for Environmental Testing

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Problem Statement & Objective

Objective: produce and characterize **secondary nanoplastics (sNPs)** that are *realistic representations* of plastic particles present in the environment.

Motivation: Plastic pollution is ubiquitous in the environment.

- **Weathering creates secondary microplastics and nanoplastics.** Environmental stresses oxidize and transform plastic pollution.

- These particles are **difficult to observe and study in the environment**, and little is known regarding their fate, transport, and interactions.

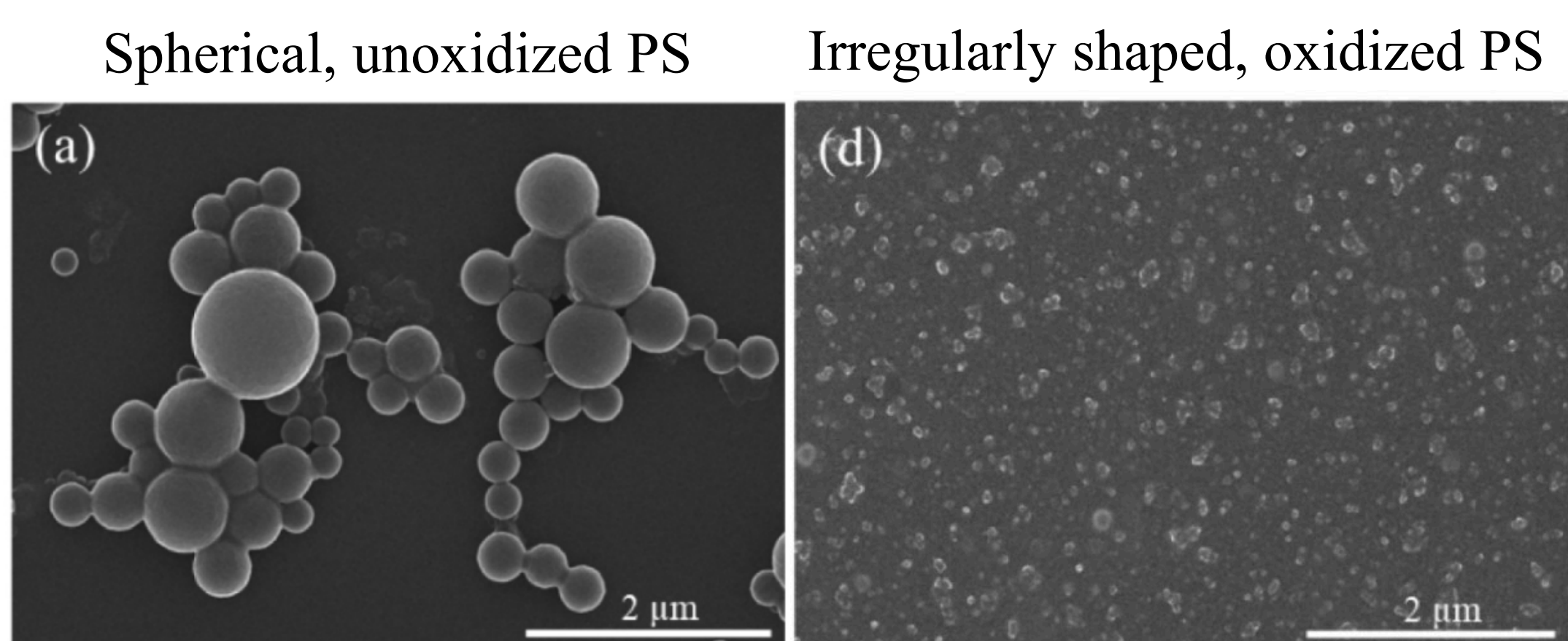
Long-Term Goal: investigate sNP behavior in environmentally relevant waters using lab experiments to address knowledge gaps on aggregation, transport, toxicity, and impact.

Literature Review

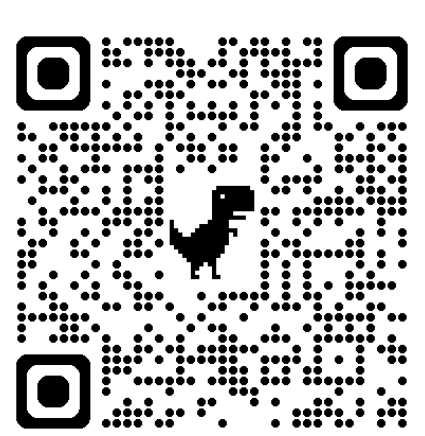
Article	Plastic	Production	Findings
Lionetto <i>et al.</i> 2021, Polymers	PET	Centrifugal milling & Ball milling	Production of MNPs 0.1 – 140 μm (avg 0.8 μm) High heat / shear leads to oxidation
Tewari <i>et al.</i> 2022, J Polymers & Environment	PET, PP	Cryomilling	Production of MPs 2 – 125 μm (80% nbr < 20 μm)
McColley <i>et al.</i> 2023, Microplastics & Nanoplastics	PS	Cryomilling	Isolation of NPs .250 – 0.600 μm No oxidation with cryomilling

Current Progress & Future Work

- PS NPs have been produced via antisolvent precipitation (spherical, unoxidized) & ball milling (irregularly shaped, oxidized).
- Comparison between the two is complicated by differences in particle size distributions.
- Exposure to UV light, mixing, and heat cause surface oxidation (hydroxyl, carbonyl, phenolic groups) and decreases particle size distribution.
- Future work:** Adapt methods for PS sNPs to cryomilling, & other polymers (PE, PP).
- Weather cryomilled sNPs to enhance realism.



Haffiez *et al.* 2024, STOTEN



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