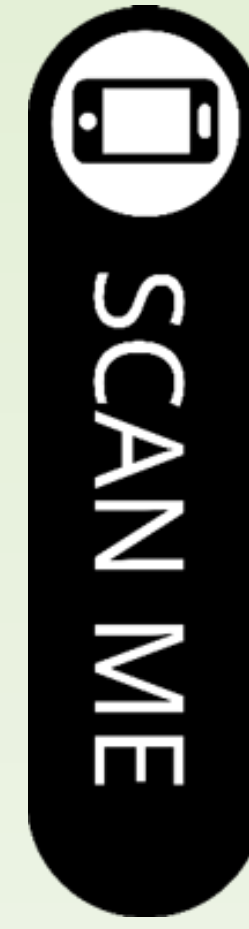


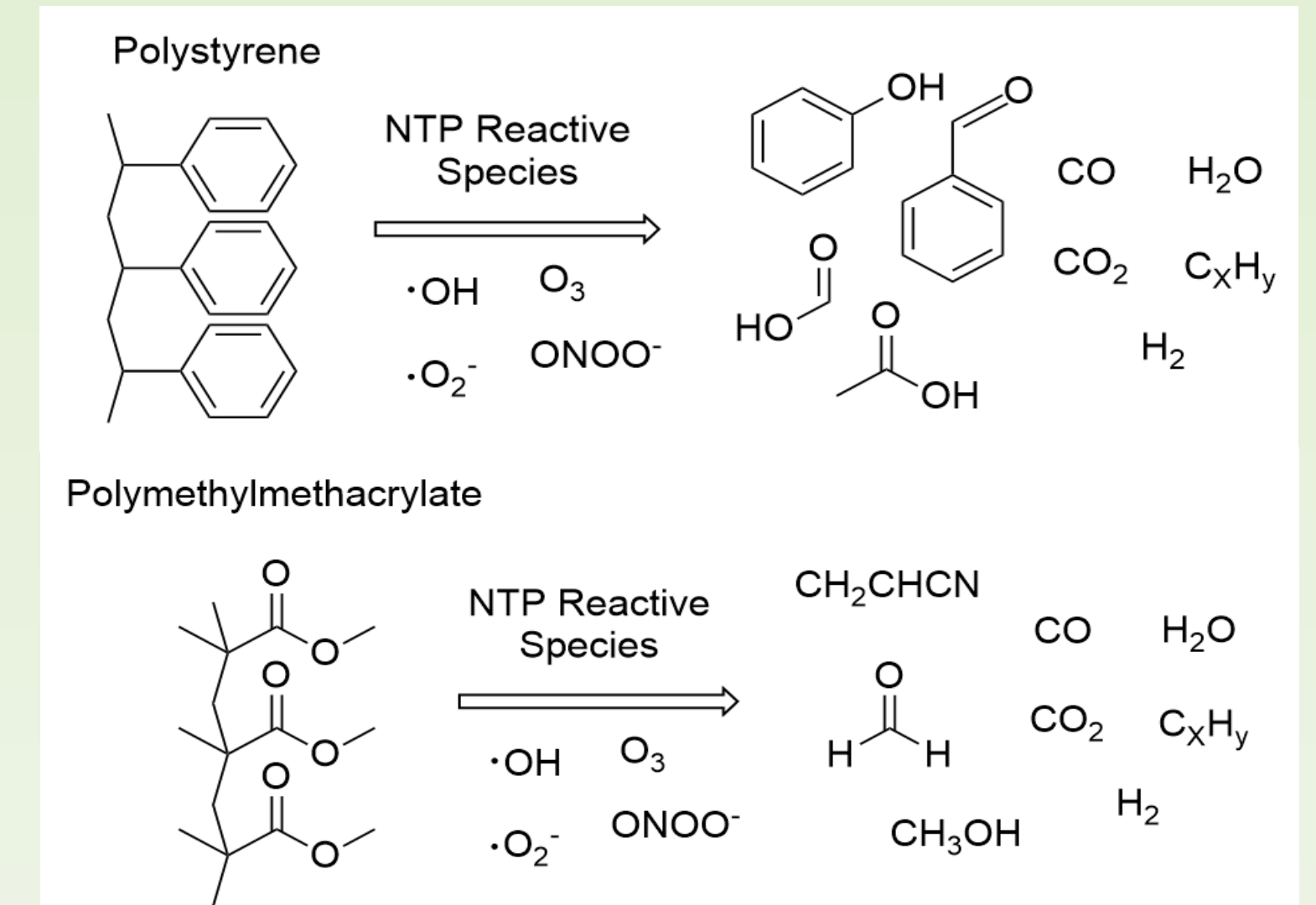
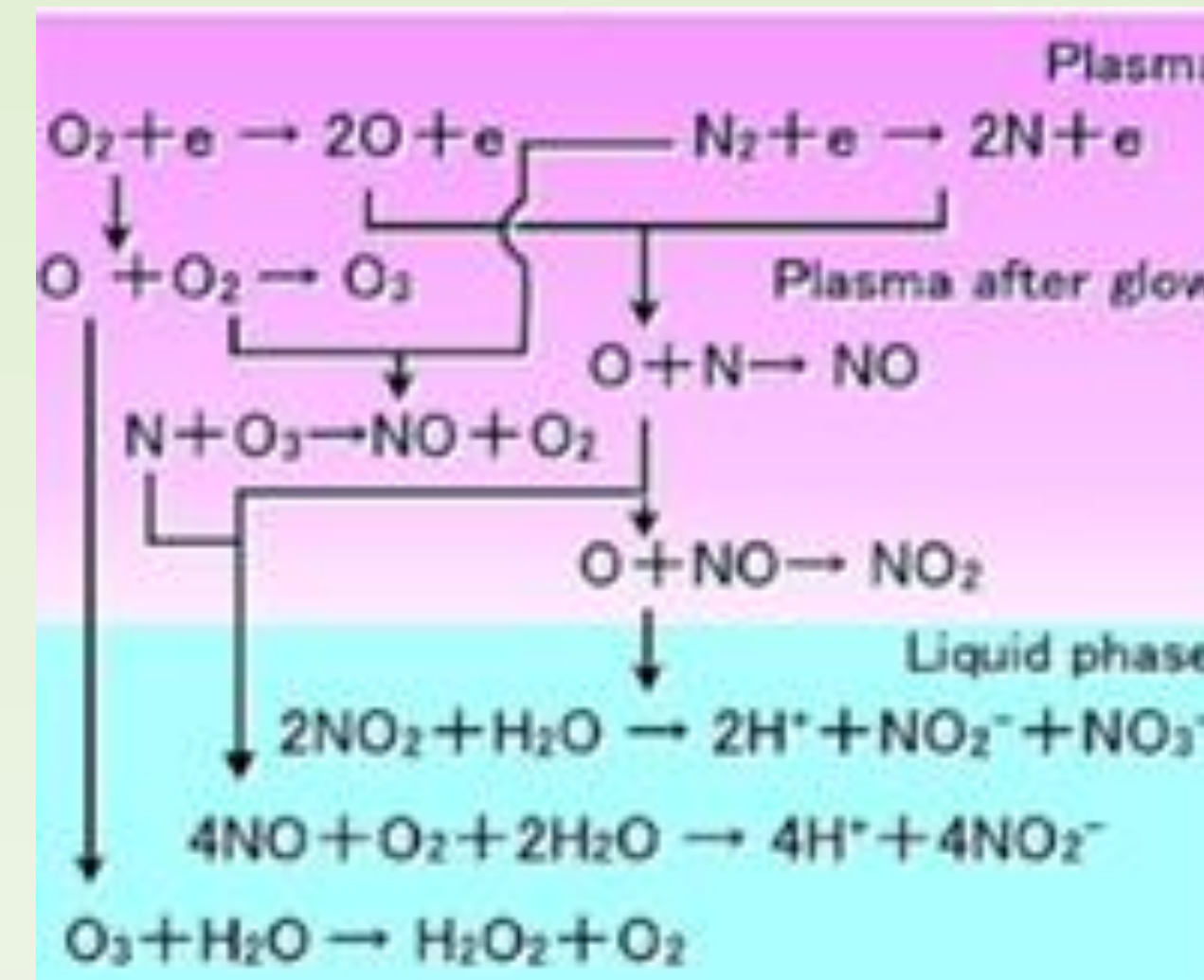
Introduction

- Microplastics are any piece of plastic <5 mm in length
- Microplastics are a widespread pollutant in the environment due to their durability. They can bioaccumulate in food chains and facilitate the transport of other pollutants.
- It is estimated that only 9% of all plastic material ever manufactured have been recycled, 12% incinerated while the remainder has been released into the environment.

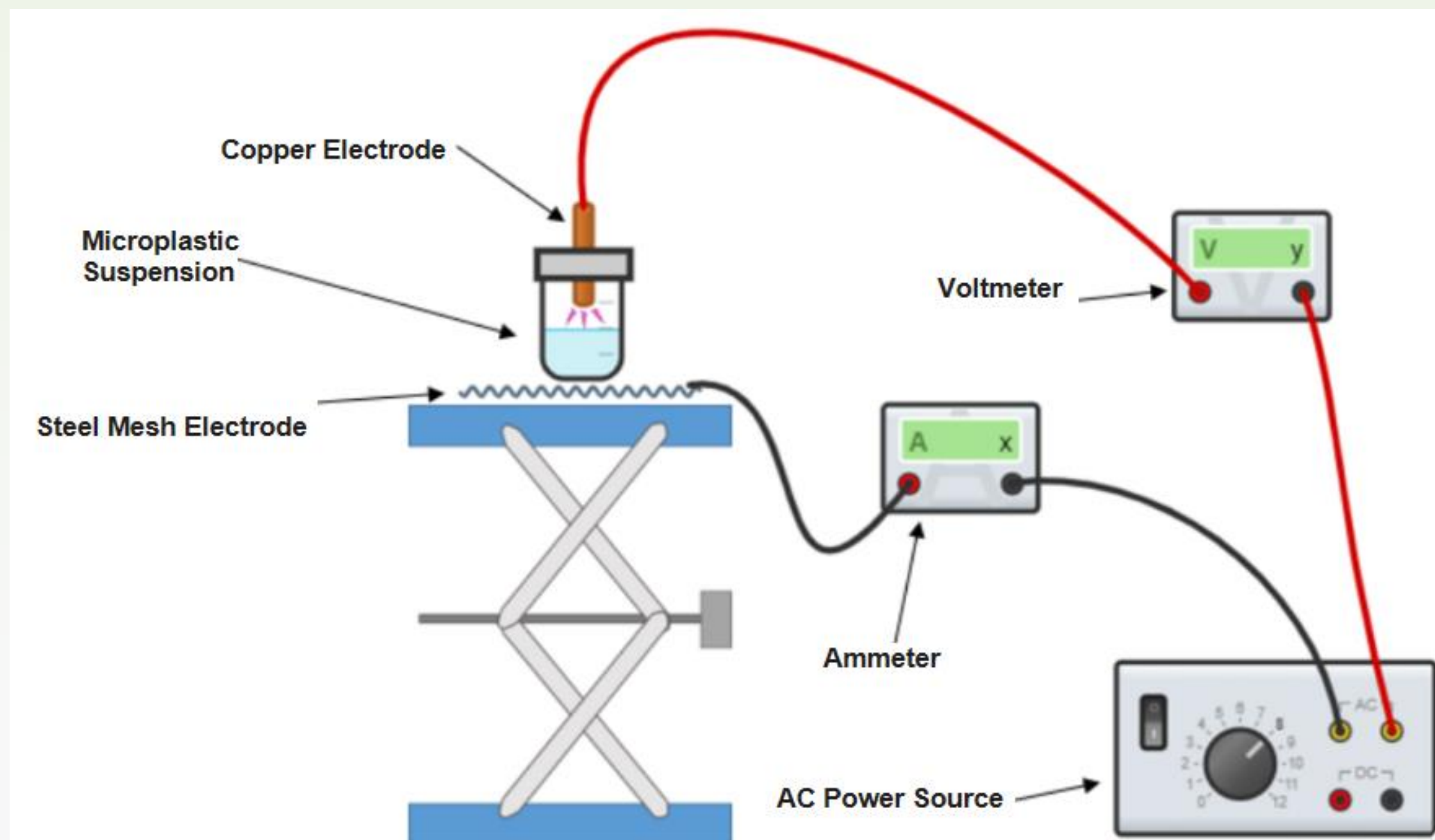


Plasma Assisted Catalysis

- Plasma is a state of matter characterised by the abundance of radicals and free electrons
- Non-Thermal Plasma (NTP) in air produces reactive species and radicals.
- These reactive species have been shown to be effective in breaking down persistent organic pollutants such as phenol and PFAS



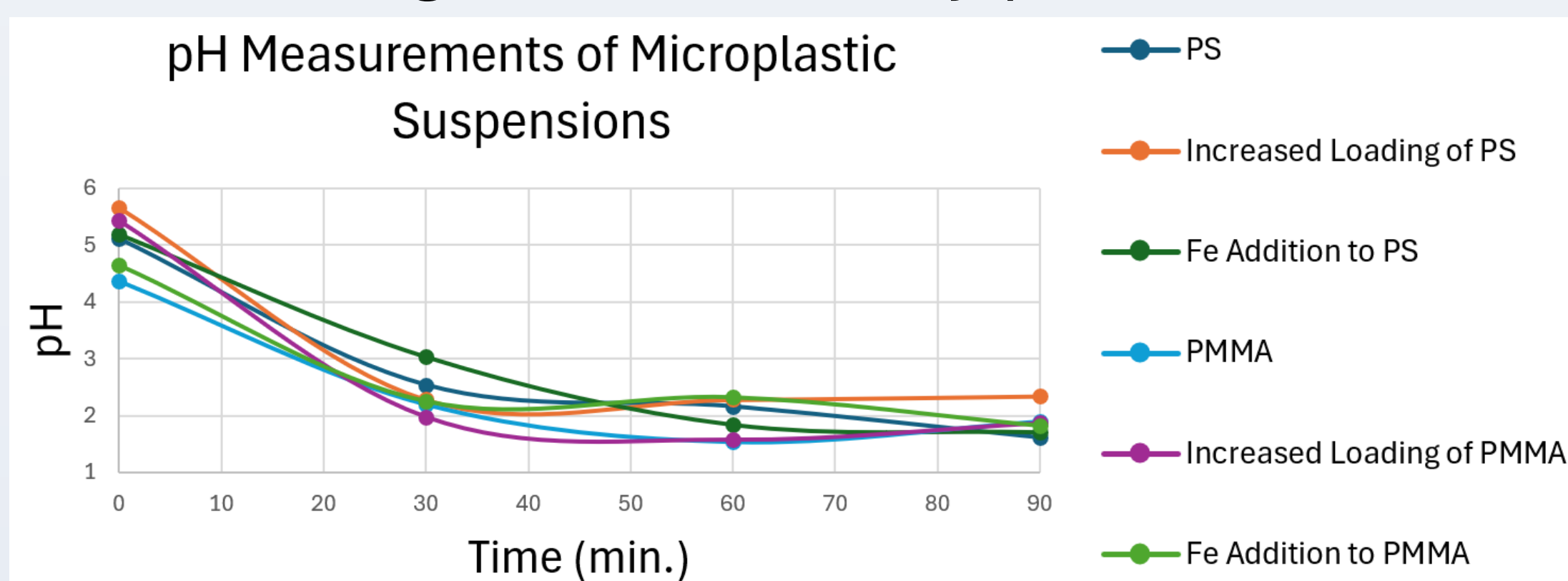
Method



- Microplastics used: Polymethylmethacrylate (PMMA) and Polystyrene (PS) due to their abundance as pollutants
- Catalyst used: Fe₂O₃ as a Fenton reagent

pH

- pH decreases with increasing exposure time to plasma
- NTP in air generates acidic by-products such as HNO₃

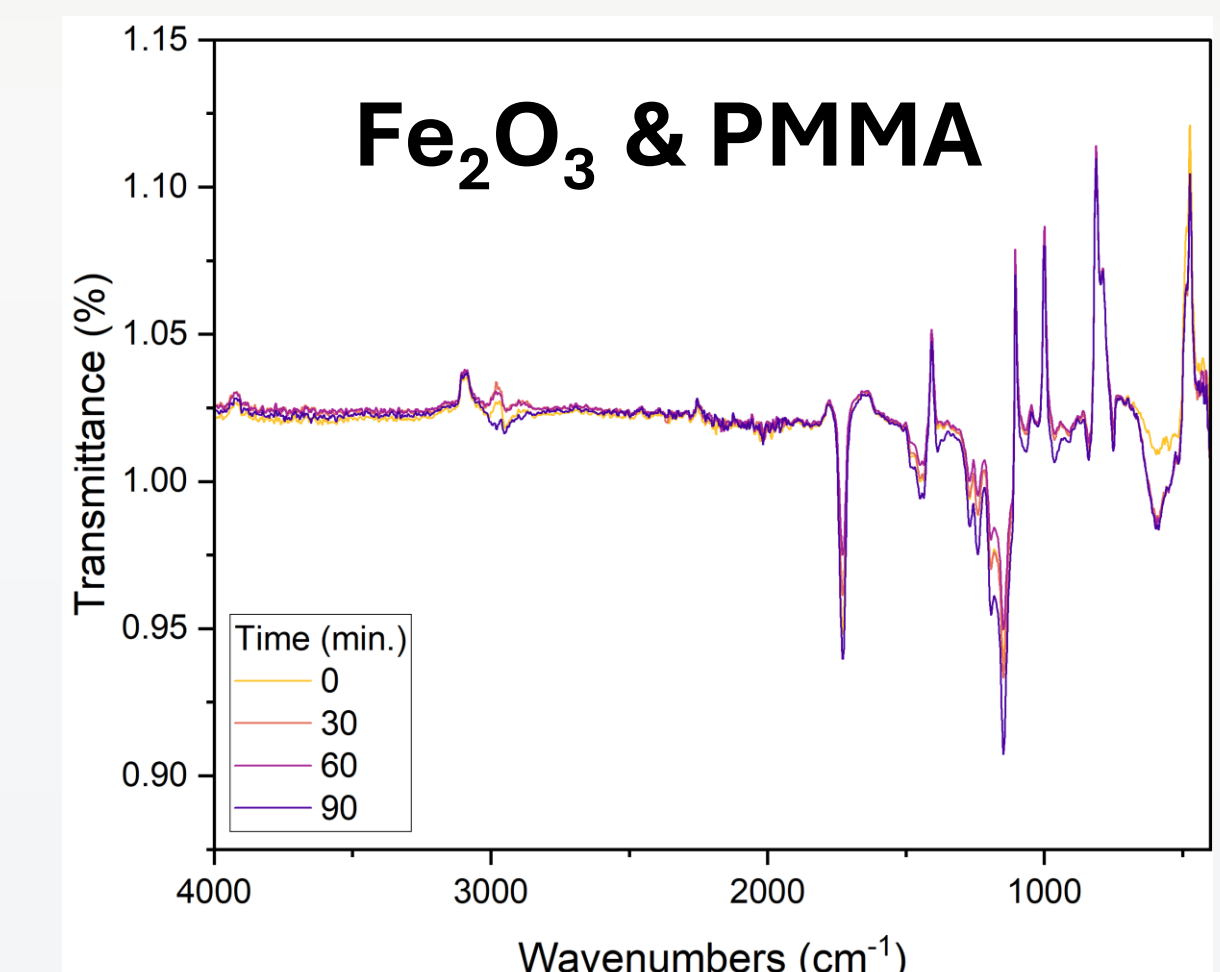
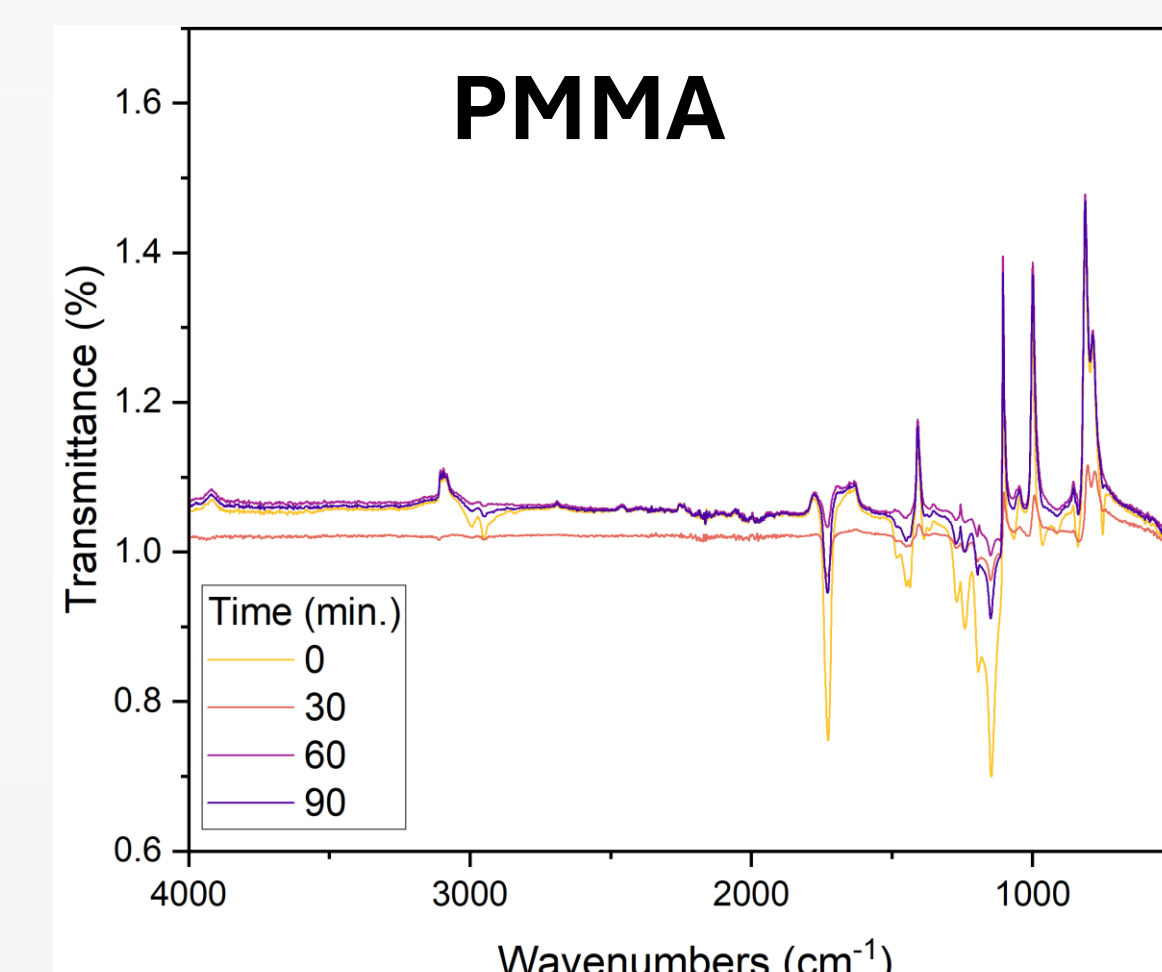
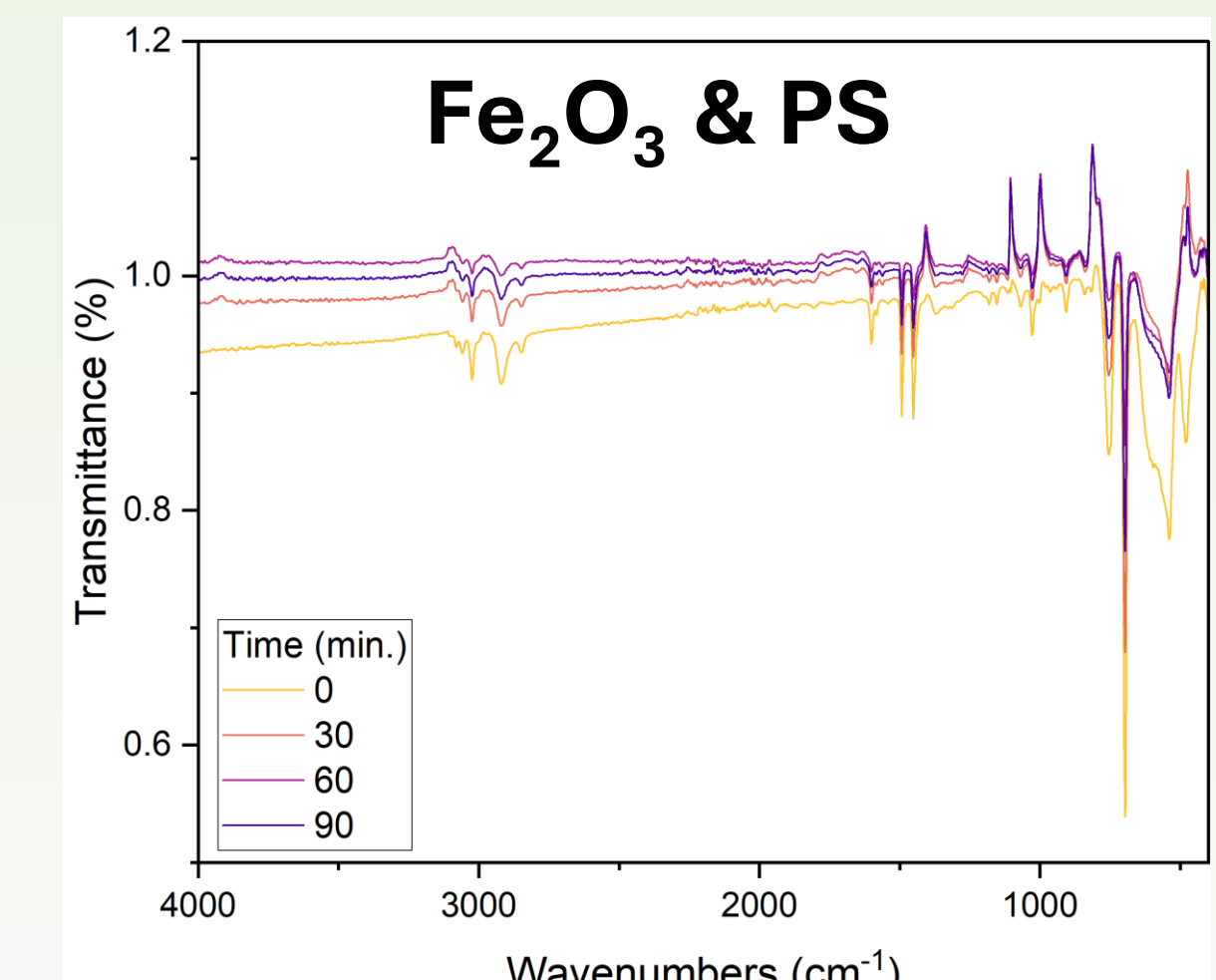
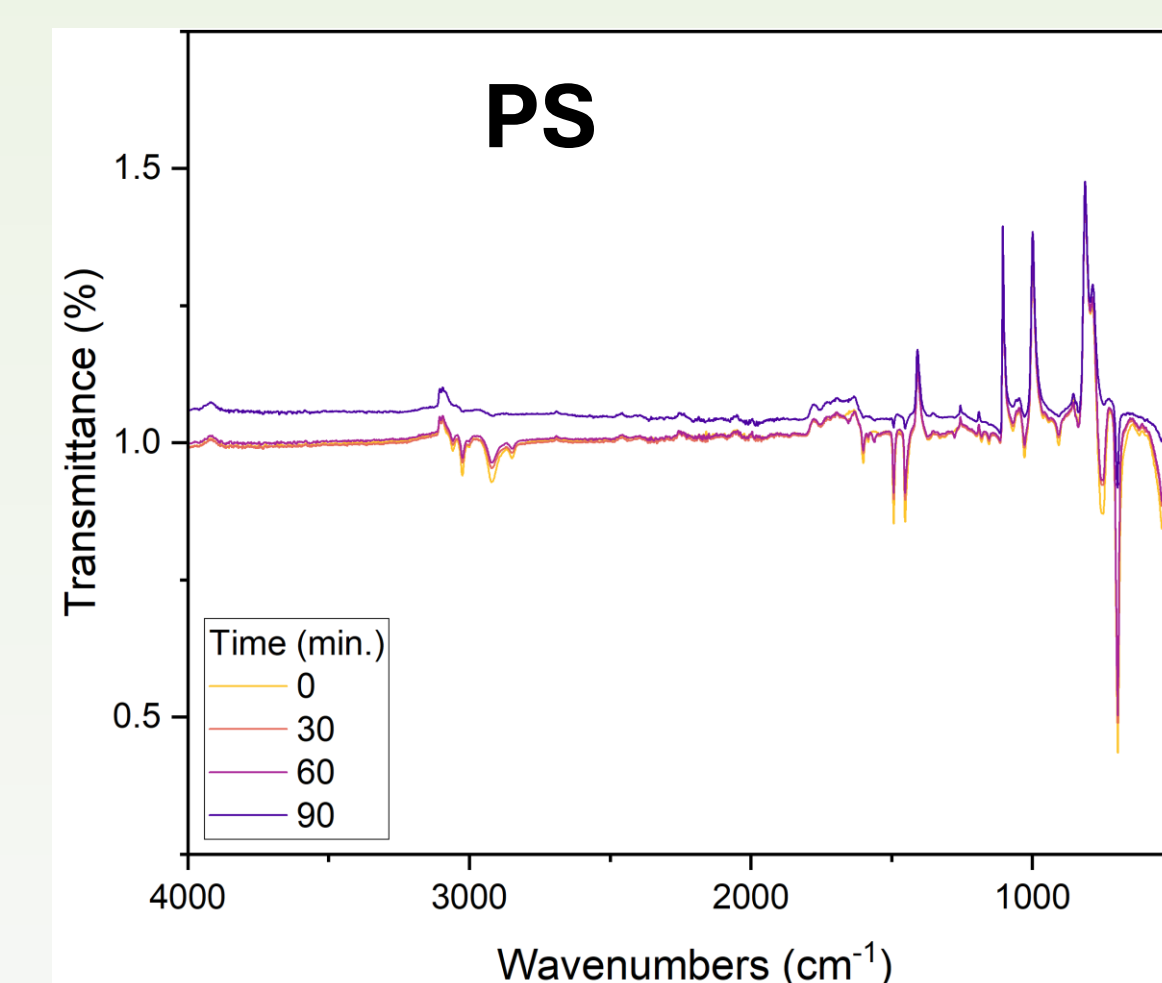


Conclusion

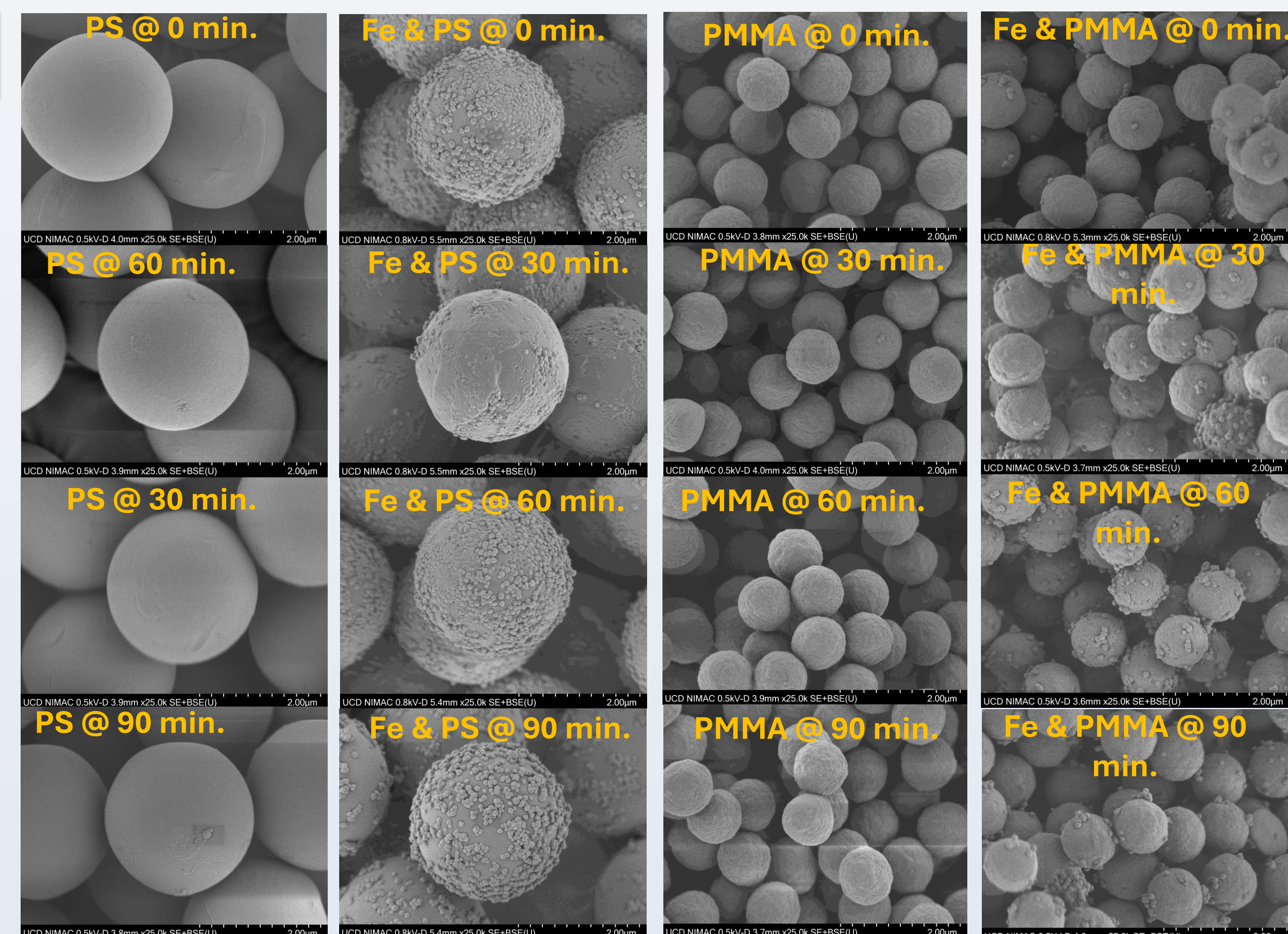
- NTP did not significantly degrade aqueous PS or PMMA microplastic
 - Increasing plasma exposure time made no increase in degradation
 - Fe₂O₃ had no catalytic effect.
- Reasons for this may include:
- Short lifetimes of reactive species which likely quenched before reaching the microplastics
 - For example:
 - $\bullet\text{OH} + \bullet\text{OH} \rightarrow \text{H}_2\text{O}_2$
 - $\text{O}_2^{\bullet-} + \text{Fe}^{3+} \rightarrow \text{O}_2 + \text{Fe}^{2+}$
 - Relatively large distance between microplastic spheres compared to distance travelled in lifetime of the reactive species

FTIR

- Spectra for PS and PMMA remained unchanged after plasma exposure with and without addition of Fe₂O₃
- Chemical structure of the microplastics was not visibly changed by plasma



SEM



References

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