# HYDROTHERMAL LIQUEFACTION OF OCEAN PLASTICS FROM THE GREAT PACIFIC GARBAGE PATCH

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The best approximations on plastic leakage to water bodies estimate it to be 9-23 Mton per year. Given yearly production of plastic resins in 2018 was 365 Mtons, we are facing a global leakage of 2.5-6.3 wt.%. This renders unprecedented environmental impacts, which must be remediated. By definition, these materials are heavily contaminated, wet, mixed and have been under harsh conditions for a long time, which prevents simpler recycling techniques to be implemented. Chemical recycling using hydrothermal liquefaction can be a feasible route for valorization of such waste, given its characteristics. In this study, a sample of ocean plastics collected in the great pacific garbage patch was processed via hydrothermal liquefaction for production of oil and monomers. Optimization of time, heating rates and temperatures was conducted aiming at maximizing oil production and quality. The waste collected was characterized to be mostly polyethylene and polypropylene, which require supercritical HTL to be fully depolymerized. When doing so, carbon yields of 50 wt% for oil and 30 wt% for gases were achieved when HTL was conducted at 440 °C for 90 min. That is, a total conversion of up to 80 wt% is shown. Such oil is composed of single ring aromatics (up to $C_{10}$), alkanes and alkenes from $C_6$ to $C_{30}$. In general, higher temperatures and longer residence times tend to consume alkanes and alkenes generating more aromatic compounds and gaseous products. The gaseous products composition has a promising profile as source of platform chemicals for monomers.

This study suits very well the PYROLIQ II 2023 theme on liquefaction of waste from fossil origin. Here we show and discuss the capabilities of HTL for handling true wasted materials collected at the largest ocean plastic patch known. Our study shows HTL would be a suitable technology to reclaim this lost carbon in the form of oil and gas, which can in turn be used for platform chemicals production. Besides, our approach depicts important parameters to consider when upscaling such process.

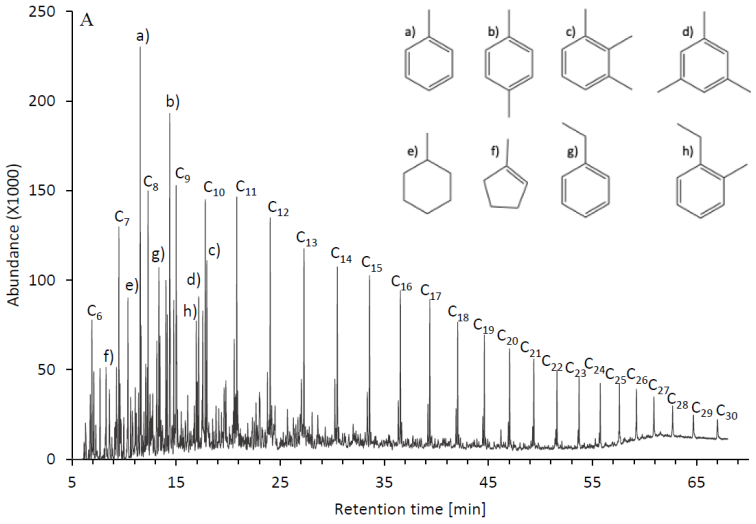


*Figure 1 – GC/MS chromatogram of oil produced from ocean plastic waste via HTL*