

ENHANCING MICROPLASTICS DEGRADATION USING Fe-RICH RED YELLOW LATOSOLS: A FENTON AND PHOTOCATALYTIC APPROACH

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Microplastics (MPs) have a long persistence in the environment due to their slow natural degradation. Fenton process and photo-catalytic reactions, where Fe plays a major role, have the potential of degrading polymers. This study aimed to investigate the impact of natural iron-rich soil on the degradation of MPs via the Fenton process and photo-catalytic reactions. Secondary MPs (< 2 mm) were manually prepared from polyethylene (PE), polypropylene (PP), poly-ethylene-terephthalate (PET), high density polyethylene (HDPE), polystyrene (PS) and polyamide (PA) and mixed separately with Fe-rich soil (red yellow latosols-RE) and Fe-low soil (immature brown loamy soil-GS) at a ratio of 40 pieces/20 g of soil. Two separate experimental set-ups were maintained for visible light (standard incandescent light bulb > 400 nm) and UV light (UV bulb in a black box-360 nm) conditions. Samples were in saturated moisture condition. A control experiment was performed without soil but with moisture only. No measures were taken to control microbial activity in any of the set-ups. After 24 hours of exposure, MPs were recovered by handpicking, weighed and analysed for morphological changes and structural modifications using SEM, FT-IR and Raman spectroscopy. The highest weight loss was observed in PE-RE (1.1%), PP-RE (2.1%) and PS-RE (1.9%) mixtures exposed to UV light. A weight increase was observed in HDPE-RE, PET-RE and PA-RE due to strong aggregations of soil particles on MPs surface. According to the variations of peak positions and intensities of FT-IR and Raman spectroscopy, PE, PET, HDPE, PS and PA showed a relatively higher degradation with Fe-rich soil compared to Fe-low soil under UV light. Even though slight surface changes were observed under SEM, complete degradation was not observed within 24 hours. However, the data confirmed that the Fe-rich soils can enhance the MPs degradation. The experiments are underway to determine the optimum time required for maximum MPs degradation.

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