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Degradation of microplastic using AOPs Sonam Gyaljen Tamang Supervisor: Dr. Gayh, Dr. Theophile

Problem statement

The review papers on degradation of microplastics (MPs) by AOPs is extremely limited even though AOPs show a high potential for MPs treatment. Therefore, it is of great importance to do studies of AOPs for the degradation of MPs ^[1].

Aim of the study

To compare the degradation processes of microplastic (PE-LD) using double dielectric barrier plasma reactor and heterogenous AOPs namely; UV/H_2O_2 and ozone/ H_2O_2 .

Methodology

Microplastics of PE-LD were manually created by cutting small pieces less than 5 mm. UV/H_2O_2 treatment was conducted for 24 hours, ozone/H₂O₂ treatment was done for 4 hours and plasma treatment for 110 minutes respectively, each for 5th iterations.

After





(b) Degradation of PE-LD using ozone/H₂O₂(H2)

(c) Degradation of PE-LD using plasma (H3)

Results

Hypothesis : H3 > H2 > H1 From experiment : H2 > H3 > H1

(a) Degradation of PE-LD using UV/H_2O_2 (H1)

Conclusion

Hence from experiment, it can be concluded that the ozone/ H_2O_2 has highest rate of degradation.

Hence, analysing via ImageJ tools, decrease in total surface area of microplatics (PE-LD) were found about $1\%^*$ in UV/H₂O₂, 10\%^* in ozone/H₂O₂ and 3\%^* in double dielectric barrier plasma reactor treatment.

*No measurement error was considered

Reference

 S. Kim, A. Sin, H. Nam, Y. Park, H. Lee, and C. Han, "Advanced oxidation processes for microplastics degradation: A recent trend," *Chem. Eng. J. Adv.*, vol. 9, p. 100213, Mar. 2022, doi: 10.1016/j.ceja.2021.100213.