# Chapter 6
# Advanced Oxidation Processes (AOPs) for the Degradation of Micro and Nano Plastic

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## ABSTRACT

*Micro-nano plastics, or MNPs, are a growing concern due to their widespread presence in the environment. To tackle this issue, advanced oxidation processes (AOPs) offer promising solutions. The focus on employing advanced oxidation processes (AOPs) to remove microplastic nanoparticles (MNPs) from water is increasing among scientists. This study compiles advancements in various AOPs such as photocatalysis, UV photolysis, ozone oxidation, electrocatalysis, Fenton oxidation, plasma oxidation, and persulfate oxidation for MNPs removal. It covers oxidation mechanisms, reaction pathways, removal efficiencies, and influencing factors. However, most AOPs achieve only modest mineralization rates, necessitating further optimization for improved performance. Exploring different AOPs is*

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*crucial for complete MNPs breakdown in water, highlighting the future importance of AOPs in MNP elimination*

## 1. INTRODUCTION

Different polymers are used to make plastic and are used extensively in daily life and industrial production because they are easy to process and mold, offer solvent resistance, and provide insulation (Jeong et al., 2023). Usually, Plastics play a ubiquitous role in various applications, with notable examples including polyethylene (PE), polypropylene (PP), and polyvinyl chloride (PVC) (Rose et al., 2023). These plastics typically have a considerable hydrophobicity and higher molecular weight, which makes it challenging for microbial and chemical processes to break them down (J. Chen et al., 2022). These plastic products therefore continue to exist in soil and water, precipitating numerous ecological health concerns and becoming a central focus of environmental research efforts. Sometimes, microplastics break down into smaller particles called nanoplastics (NPs) (Monira et al., 2023). While there is no exact range of sizes for nanoplastics, most research defines them as particles having a diameter of below 0.1 μm or 1 μm (Z. Chen et al., 2021). MNPs have various shapes and colors, such as pellets, films, fibers, foams, and fragments (Murphy, Ewins, Carbonnier, & Quinn, 2016; Nakanishi, Yamaguchi, Hirata, Nakashima, & Fujiwara, 2021). They have different sources and also have different impacts on the human body as shown in Figure 1.

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