

RECYCLING OF PLASTIC SOLID WASTES – A REVIEW



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ABSTRACT

Plastic pollution is one of the most critical environmental challenges today, with plastic solid waste (PSW) being a major contributor to this crisis. As global plastic production and consumption continue to rise, the development of sustainable methods for managing plastic waste has become crucial. Recycling offers a significant opportunity to reduce the negative environmental impacts of PSW. This review provides an extensive examination of the current state of PSW recycling. Over the past five years, the total production of plastic has increased from 370.5 million tonnes (MT) in 2018 to 400.3 MT in 2022. This study includes a comparative analysis of plastic production sources worldwide, covering bio-based, chemically recycled, mechanically recycled, and fossil-based plastics. Additionally, the review explores the utilization of plastic waste in various sectors, such as the textile industry, construction, fuel production, and packaging. It addresses the development of techniques for managing post-consumer plastic waste and highlights the challenges in plastic waste management, including landfilling, incineration, and microplastic pollution. These issues underscore the serious environmental problems caused by the accumulation of plastic waste. The evaluation of PSW recycling processes encompasses a range of techniques, including closed-loop recycling, mechanical recycling, energy recovery, hydrothermal liquefaction, pyrolysis-based chemical recycling, and gasification-based chemical recycling. The study also delves into modern methods and technologies aimed at improving plastic waste management, such as biotechnology, mechanochemistry, ambient-temperature photo-reforming, and designing for recyclability. These advanced methods provide insights into potential future advancements that could mitigate the environmental effects of plastic waste. Recycling is currently one of the most effective mitigation strategies and represents a dynamic and rapidly evolving sector within the plastic industry. This review underscores the importance of continued innovation and collaboration in developing sustainable solutions to address the plastic pollution crisis.

Keywords: Plastic production, Recycling and energy recovery, Landfilling, Incineration, Microplastic pollution, Plastic waste recycling, Plastic waste management.

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