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Tackling Low-Value Plastics: Environmental and Health Concerns

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ABSTRACT

Plastic pollution, spanning macroplastics to nanoplastics, poses multifaceted challenges. Low-value plastics (LVP), like multi-layered plastics (MLP) and soft plastics, are often discarded, exacerbating environmental issues. LVP's classification, with high collection costs and complex recycling, demands immediate attention. This study explores LVP management solutions, including converting to plastic lumber and RDF products. Anticipated advancements in multilayer plastic recycling offer hope, with downcycling as an option. LVP's environmental and health impacts, including microplastic contamination and toxin release during incineration, underscore the need for sustainable waste practices and plastic alternatives. Addressing LVP is crucial for environmental and human health, ensuring sustainability.

Keywords: Low-value plastics, Multi-Layered Plastic (MLP), Health implications, Recycling challenges

INTRODUCTION

The multifaceted nature of plastic pollution, categorized into macroplastics, microplastics, and nanoplastics, presents varying challenges and associated risks (Mitrano et al., 2021). Among these concerns, the management of low-value plastics has often been overlooked. While valuable plastics are diligently collected for recycling, low-value plastics like Multi-Layered Plastic (MLP) and soft plastics are often discarded in local areas, significantly contributing to environmental pollution, particularly in waterways and oceans.

Low-value plastics present a unique challenge due to their classification, where the collection and processing costs outweigh the revenue from reclaimed plastic sales. Notably, materials like MLP and soft plastics, with their complex compositions and inefficient recycling processes, compound this issue. This complexity hinders effective management, demanding immediate attention to curb their unchecked presence in the environment.

LITERATURE REVIEW

Low Value Plastics: Recycling Dilemma

Low-value plastics (LVP) encompass plastic materials for which the cost of recycling surpasses the revenue from selling reclaimed plastic, notably including Multi-Layered Plastic (MLP) and soft plastics. MLP, with its intricate composition comprising multiple materials such as aluminum, plastics, and paper, demands an energy-intensive separation process, rendering recycling economically infeasible. Similarly, soft plastics, composed of diverse plastic types, often undergo "downcycling" into lower-value products due to expensive separation procedures. Consequently, LVP, which encompasses plastic waste not separated from other refuse, necessitates extensive preparatory measures and is

classified as low-value plastic (LVP) (King, 2023).

Multilayer plastic packaging, renowned for its versatility, confronts recycling challenges owing to contamination and its lightweight, low-value nature. These plastics exhibit resistance to moisture, oils, and odours, enhanced by highly reflective aluminum surfaces. However, their intricate composition and diminutive dimensions deter waste pickers, impeding recycling endeavours (Halim et al., 2018).

This study explores solutions for managing LVP waste, including conversion to plastic lumber, refuse-derived fuel (RDF) production, and other plastic products. Although technologically mature, these options face challenges such as branding, government endorsement, and cost-effective collection (Soemadijo et al., 2022). Anticipated advancements in multilayer plastic recycling technology, particularly in high-income nations, include cutting-edge sorting techniques and chemical recycling methodologies over the next decade. Downcycling also offers a viable approach (Soares et al., 2022).

Multilayer films can be recycled through modifications and composite materials, employing injection moulding and extrusion methods. However, it is essential to note that purchasing plastic credits from a U.S. bottling company to support low-value plastic recovery in India does not reduce U.S. plastic waste generation or litter (Moon, 2022).

The Environmental and Health Impacts of Low-Value Plastics

The emergence of low-value plastics has exacerbated the issue, generating extensive garbage that contaminates the environment and disrupts soil health and agriculture through microplastic contamination (De Souza Machado et al., 2018). Plastic waste's slow degradation, especially in marine environments where approximately 150 million tonnes accumulate, poses a significant threat to aquatic ecosystems and the food chain (Wright et al., 2013). Additionally, the incineration of plastic waste releases harmful toxins into the air, impacting human health and the environment (Verma et al., 2016). The additives and materials used in plastic production can have adverse health effects, including liver problems, skin issues, and respiratory difficulties (Hahaladakia et al., 2018). To address this crisis and its potential health risks, efficient waste management practices and sustainable alternatives to plastic must be adopted.

CONCLUSION

The multifaceted challenge of low-value plastics (LVP) mismanagement presents significant environmental and health risks. These plastics, including Multi-Layered Plastic (MLP) and soft plastics, pose unique recycling dilemmas due to their economic inefficiencies and complex compositions. The unchecked presence of LVP in the environment, particularly in waterways and oceans, contributes to widespread contamination. The environmental consequences encompass microplastic pollution, threats to aquatic ecosystems, and harmful toxins released into the air through incineration. The potential health effects linked to the additives and materials used in plastic production are equally concerning. To tackle this crisis effectively, it is imperative to prioritize sustainable waste management practices and explore viable alternatives to plastic. Addressing the mismanagement of low-value plastics is essential to mitigate the detrimental environmental and human health impacts, ensuring a more sustainable and healthier future.

Declaration by Authors

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