Reviews on Advanced Materials and Technologies, 2025, vol. 7, no. 1, pp. 24–52
DOI: 10.17586/2687-0568-2025-7-1-24-52

Sustainable Polymer Composites from Industrial Wastes

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Abstract. Sustainable polymer composites derived from industrial waste offer a viable solution to resource scarcity and environmental concerns. This review explores the development, properties, and applications of composites incorporating fly ash, slag, agricultural residues, and recycled polymers. Utilizing these waste materials minimizes environmental impact while enhancing mechanical, thermal, and chemical properties. Key processing techniques such as melt blending, extrusion, and additive manufacturing contribute to performance optimization. The review also addresses challenges related to waste compatibility, durability, and large-scale production, proposing effective solutions. Integrating sustainable polymer composites with circular economy principles enables their application in construction, automotive, and packaging industries. Emphasizing the need for further research, this study highlights the potential of these composites to contribute to a more sustainable future.

Citation: Rev. Adv. Mater. Technol., 2025, vol. 7, no. 1, pp. 24–52

View online: https://doi.org/10.17586/2687-0568-2025-7-1-24-52

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