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Waste to Wealth: Advances in Sustainable Engineering and Smart Materials

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Sustainable Engineering: Advanced Materials and Intelligent Solutions explores how innovative materials and emerging technologies are reshaping the future of sustainable engineering. Focusing on the principles of the circular economy, the book demonstrates how waste and recycled resources—including tempered glass, desert dune sand, and synthetic textiles—can be transformed into high-performance materials for applications in construction, manufacturing, and advanced engineering.

The volume examines cutting-edge developments in bio-composites, nanomaterials, self-healing infrastructure, smart manufacturing, and IoT-enabled sustainability solutions. By integrating advances in materials science, civil engineering, and digital technologies, it presents practical strategies for improving resource efficiency, reducing environmental impact, and extending the lifecycle of engineered systems.

Through a collection of contemporary research and real-world applications, the book highlights how intelligent material design and sustainable engineering practices can address global challenges while supporting resilient infrastructure and responsible industrial growth.

Designed for researchers, engineers, graduate students, industry professionals, and policymakers, this book serves as both a technical reference and a practical guide for developing innovative, environmentally responsible solutions that align engineering excellence with the goals of a sustainable future.

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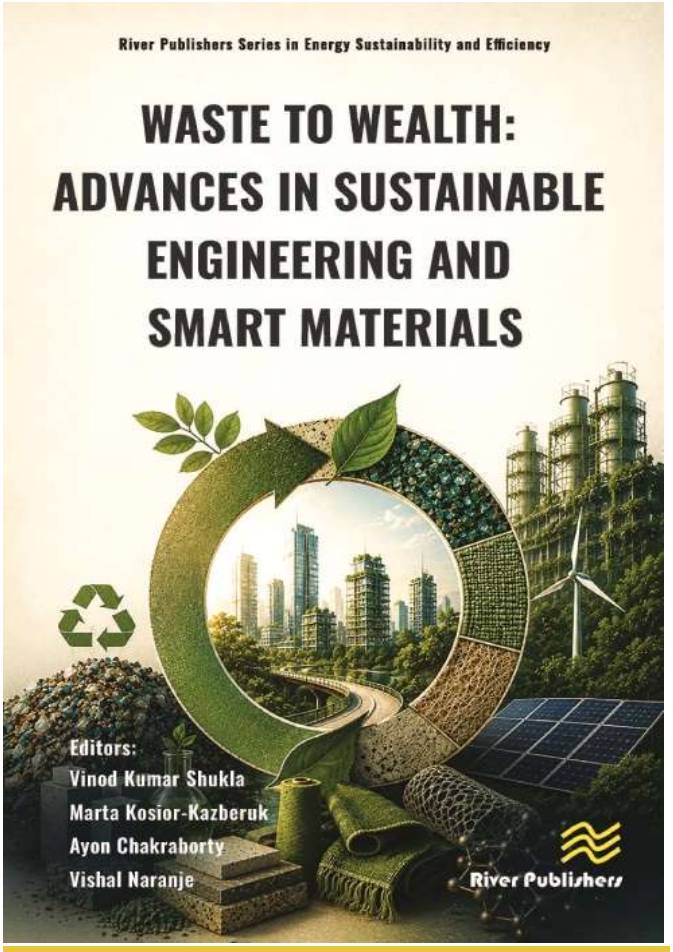

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