Journal of Composites Science

an Open Access Journal by MDPI

CiteScore: 6.7
Impact Factor: 4.6

Special Issue Reprint

Editorial Board Members' Collection Series

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This is a Reprint of the Special Issue Editorial Board Members' Collection Series: Modeling and Simulation of Composite Materials that was published in the *Journal of Composites Science*. Advanced composites deliver superior mechanical and multifunctional performance compared with monolithic counterparts. However, their vast and nonlinear design space—shaped by fiber architecture, constituent behavior, and multiscale defects—renders purely experimental characterization costly and inefficient. As a result, predictive modeling and high-fidelity simulation have become essential for the analysis, design, and optimization of composite structures. This Reprint compiles twenty peer-reviewed studies that represent the state-of-the-art in computational and data-driven approaches to composite mechanics. Topics include multiscale constitutive modeling, finite element analysis of damage and failure, machine learning-based property prediction, fatigue life assessment, nondestructive evaluation, and structural optimization. By integrating analytical, numerical, and experimental methodologies, the volume demonstrates how advanced simulation frameworks can shorten development cycles, enhance reliability assessment, and support informed material selection for demanding engineering applications. It provides a rigorous and comprehensive reference for researchers, engineers, and graduate students engaged in composite material modeling and design.

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