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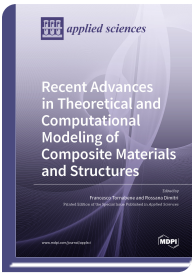
Recent Advances in Theoretical and Computational Modeling of Composite Materials and Structures



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The advancement in manufacturing technology and scientific research has improved the development of enhanced composite materials with tailored properties depending on their design requirements in many engineering fields, as well as in thermal and energy management. Some representative examples of advanced materials in many smart applications and complex structures rely on laminated composites, functionally graded materials (FGMs), and carbon-based constituents, primarily carbon nanotubes (CNTs), and graphene sheets or nanoplatelets, because of their remarkable mechanical properties, electrical conductivity and high permeability. For such materials, experimental tests usually require a large economical effort because of the complex nature of each constituent, together with many environmental, geometrical and or mechanical uncertainties of non-conventional specimens. At the same time, the theoretical and/or computational approaches represent a valid alternative for designing complex manufacts with more flexibility. In such a context, the development of advanced theoretical and computational models for composite materials and structures is a subject of active research, as explored here for a large variety of structural members, involving the static, dynamic, buckling, and damage/fracturing problems at different scales.

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