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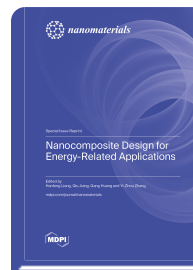
Special Issue Reprint

Nanocomposite Design for Energy-Related Applications

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Nanocomposites, which integrate multiple nanoscale components, are a major research focus due to their unique properties and broad industrial potential. Engineered at the nanoscale, these materials exhibit electronic, physical, and mechanical characteristics that are vastly different from their bulk forms. This is particularly advantageous for advanced energy technologies, including batteries, supercapacitors, solar cells, fuel cells, and catalysts. The power of nanocomposites lies in the synergistic combination of their constituent nanomaterials, creating enhanced or entirely new functionalities that are unattainable by individual components. This synergy allows for the precise tuning of chemical composition and morphology, enabling highly specialized applications. In energy storage, nanocomposites offer a higher energy density, a longer cycle life, and faster charging than conventional materials. They improve the efficiency and stability of solar cells and fuel cells, aiding the adoption of renewable energy. Furthermore, their unique surface properties make them exceptional multifunctional catalysts that are useful in sustainable energy production and environmental cleanup. The ability to tailor nanocomposites opens new avenues for energy harvesting, conversion, and storage. Their potential to improve existing systems and enable novel technologies is transformative, positioning them as a cornerstone for future advances in sustainability.



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