



Gels

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Special Issue Reprint

Research Progress and Application Prospects of Gel Electrolytes

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This Reprint provides a current and comprehensive survey of the scientific and technological changes that influence the field of gel electrolytes. It is a compilation of research from materials chemistry, electrochemistry, and device engineering that shows that soft ion-conducting gels are at the core of the performance, safety, and adaptability of new electrochemical systems. The combined papers reveal the progress of polymer and hybrid networks for efficient ion transport, the use of ceramic and nanostructured fillers, and the development of mechanically strong gel membranes for the coming batteries and supercapacitors. The Reprint also highlights the increasing importance of gel electrolytes in flexible and wearable electronics, where their inherent stability and leak resistance make it possible to create new device architectures. Some of the contributions also highlight that data-driven design, 3D printing, and microstructural control are transforming the gel systems from an empirical formulation to engineered, predictable systems faster. These works, in concert, delineate the present technological base and the challenges that still exist in interfacial stability, durability, thermal resilience, and sustainable fabrication. By presenting both fundamental insights and novel applications, this Reprint is a testament to the rapid progress of the field and serves as a consolidated reference for the prospects of gel electrolytes for future electrochemical technologies.



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