

Electrospun Nanofibers-Based Moist-Electric Generators

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Abstract. Moisture-electric generators provide an innovative and sustainable method for harvesting electricity directly from ambient atmospheric humidity through hygroscopic interactions and ion transport processes. Among diverse architectures, those based on electrospun nanofibers are particularly promising due to their high surface area, superior breathability, mechanical flexibility, and seamless integration into wearable systems. This review provides a comprehensive summary of recent advances in electrospun nanofiber moisture-electric generators, with a focus on fabrication techniques via electrospinning, material optimization through functional additives, device performance metrics, and emerging applications in self-powered wearable electronics, sensors, and smart textiles. Significant improvements in power output and durability have been reported in hybrid designs. Nonetheless, challenges in long-term reliability, manufacturing scalability, and conversion efficiency hinder widespread adoption. Future directions include multifunctional materials, asymmetric device designs, and scalable production strategies to enable practical, battery-free power sources for next-generation wearable technologies.

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