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Exploring the Potential of PVDF/CCB Composites Filaments as Potential Materials in Energy Harvesting Applications

Authors : Fawad Ali, Mohammad Albakri

Abstract : The increasing demand for advanced multifunctional materials has led to significant research in polymer composites, particularly polyvinylidene fluoride (PVDF) and conducting carbon black (CCB) composites. This paper explores the development and application of PVDF/CCB conducting electrodes for energy harvesting applications. PVDF is renowned for its chemical resistance, thermal stability, and mechanical strength, making it an ideal matrix for composite materials in demanding environments. When combined with CCB, known for its excellent electrical conductivity, the resulting composite electrodes not only retain the advantageous properties of PVDF but also gain enhanced electrical conductivity. This synergy makes PVDF/CCB composites suitable for energy-harvesting devices that require both durability and electrical functionality. These electrodes can be used in sensors, actuators, and flexible electronics where efficient energy conversion is critical. The study provides a comprehensive overview of PVDF/CCB conducting electrodes, from synthesis and characterization to practical applications, and discusses challenges in optimizing these materials for industrial use and future development. This research aims to contribute to the understanding of conductive polymer composites and their potential in advancing sustainable energy technologies. This paper explores the development and application of polyvinylidene fluoride (PVDF) and conducting carbon black (CCB) composite conducting electrodes for energy harvesting applications. PVDF is renowned for its piezoelectric and mechanical strength, making it an ideal matrix for composite materials in demanding environments. When combined with CCB, known for its excellent electrical conductivity, the resulting composite electrodes not only retain the advantageous properties of PVDF but also gain enhanced electrical conductivity. This synergy makes PVDF/CCB composites suitable for energy-harvesting devices that require both durability and electrical functionality. These electrodes can be used in sensors, actuators, and flexible electronics where efficient energy conversion is critical. The study provides a comprehensive overview of PVDF/CCB conducting electrodes, from synthesis and characterization to practical applications. This research aims to contribute to the understanding of conductive polymer composites and their potential in advancing sustainable energy technologies.

Keywords : additive manufacturing, polyvinylidene fluoride (PVDF), conducting polymer composite, energy harvesting, materials characterization
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