Electrospun Nanocomposite Fibers of Recycled Polystyrene Foams: An Efficient Atmospheric Fog Water Generator

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The production of various plastic wastes is increasing day by day and has become a growing concern to the serious environmental challenges. This type of waste is rarely resolved by microorganisms; hence, the recycling to the value-added materials is essential. Recycling of plastics has significant industrial importance in reducing greenhouse gases, water, and air pollution, and soil contamination, as well as conserving natural resources. It is one of the prospective routes for transforming low-value waste plastics into high-value products. Recycling the polymer wastes for the fabrication of superhydrophobic nanofibers for fog harvesting could be a partial solution to environmental issues. In this work, recycled expanded polystyrene (EPS) foam with various proportions of titanium dioxide nanoparticles (TiO_2 NPs) and aluminum microparticles (Al μPs) was spun into superhydrophobic nanocomposite fibers using the facile electrospinning technique. The morphology, surface hydrophobicity, and fog harvesting capacity of the nanocomposite fibers were investigated. Test results showed that the as-prepared nanocomposite fibers exhibit superhydrophobic characteristics with a water contact angle of 152° and an efficient fog harvesting capacity of 561 mg/cm^2/hr and are reusable. Such fiber materials are extensively employed in wastewater treatment, energy storage, air purification, selective oil absorption, biological and chemical sensors, tissue engineering, composite reinforcement, and many other applications.