UV-Active Azobenzene/Perovskite Composites; Impacts on Energy Efficiency

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The development of next-generation autonomous devices capable of self-powering through ambient energy harvesting has increasingly focused on piezoelectric nanoparticle-based nanogenerators, owing to their remarkable flexibility and high electrical output. In this study, a novel flexible nanogenerator is presented, comprising piezoelectric barium titanate ($BaTiO_3$) nanoparticles integrated with an azobenzene-based resorcin[4]arene polymer, which enables the direct conversion of light into electrical current. The underlying principle of this approach resides in the polymer's capacity to absorb light and undergo reversible photoinduced conformational changes, thereby generating sustained mechanical motion. This mechanically induced strain is subsequently transduced into a stable electrical current by the embedded piezoelectric nanoparticles. The synthesized polymer was characterized using Fourier-transform infrared spectroscopy (FT-IR), nuclear magnetic resonance (NMR) spectroscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM). Following the coupling of $BaTiO_3$ nanoparticles with the azobenzene-based octameric polymer, alternating current (AC) measurements were performed using an electrochemical workstation (PGSTAT302N, Metrohm Autolab). The resulting azobenzene/perovskite composite material is proposed for potential applications in nanotechnology within the field of renewable energy.

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