# ULTRAVIOLET PHOTODETECTORS BASED ON $TiO_2$-COMPOSITE MATERIALS

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**Abstract**

Lately, sensors have played an important role in various aspects of our daily lives especially chemical sensors which serve as essential tools for capturing real-time chemical data from our environment. Such information can supply control systems with vital feedback across a wide range of chemical processes—including the detection of toxic substances and explosives, activation of safety alerts for gas appliances, protection mechanisms for workers exposed to chemical risks, environmental monitoring, regulation of the food supply chain, and even health monitoring [1]. Photodetectors are gaining increasing attention due to their relevance in everyday life, and lately the metal oxides materials are widely used in the development of UV sensors due to their wide bandgaps, high thermal and chemical stability, and photoconductivity under UV illumination [2]. As materials for sensors, numerous approaches have been used to study metal oxide material nanostructures from the perspectives of synthesis, structure, and properties, and titanium dioxide ($TiO_2$) is a versatile compound known for its brightening and UV-absorbing properties, non-toxicity, and chemical stability.

In this research, the heterostructures based on aero-$TiO_2$ and $TiO_2$/$CuMnO_2$ materials were successfully used for development of ultraviolet photodetectors, and characterization under ultraviolet irradiation was assessed. The as-obtained heterostructures were morpho-structural characterized by X-ray diffraction (XRD), UV-Vis spectroscopy and Scanning Electron Microscopy (SEM), and analysis. To demonstrate the *n*-$TiO_2$/*p*-$CuMnO_2$ heterojunction, the Mott-Schottky measurement was performed. The UV sensing measurements were performed at ambient temperature in dark and under UV irradiation at $\lambda$ = 365 nm and $\lambda$ = 395 nm, using a commercial LED source. The *I-V* measurements of the n-$TiO_2$ nanolayer/p-$CuMnO_2$ thin film heterostructure confirm its diode characteristics under dark state, UV and VIS conditions [3]. In conclusion, the $TiO_2$-based heterostructures demonstrates the practical viability and application potential of this emerging class of materials in sensing technologies.

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