SYNTHESIS OF NOVEL SEMICONDUCTOR MATERIALS INCORPORATING POLYPROPYLENE AND POLYACRYLATE ACETATE WITH $TISrO_3$ ADDITIVES

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Abstrac: This article presents a detailed investigation into the development of advanced semiconductor materials derived from polypropylene (PP) and polyacrylate acetate (PAA), incorporating titanium strontium oxide ($TiSrO_3$) as an additive. The study evaluates the influence of $TiSrO_3$ on the structural, electrical, and thermal characteristics of the composite materials. Using established synthesis protocols and characterization techniques such as XRD, SEM, and TGA, the research outlines the enhanced properties attained through the integration of $TiSrO_3$.

Keywords: Semiconductor materials, polypropylene, polyacrylate acetate, $TiSrO_3$.

Introduction The continuous evolution of electronic materials necessitates the development of polymers with tunable properties suitable for semiconductor applications. Polypropylene (PP) and polyacrylate acetate (PAA) are widely employed due to their excellent mechanical strength and flexibility. However, their inherent limitations in conductivity hinder broader application in electronic devices. To address this, inorganic nanostructured additives like titanium strontium oxide ($TiSrO_3$) are being explored for their unique electrical and dielectric properties. This research focuses on creating composite materials by integrating $TiSrO_3$ into PP and PAA matrices to enhance their semiconducting capabilities. We explore the mechanisms underlying property enhancements and assess their suitability for electronic component fabrication [1,2].

Methodology Materials: The base polymers, PP and PAA, were acquired in pellet and aqueous solution forms, respectively. $TiSrO_3$ powder with nanometer-sized particles was synthesized using a sol-gel method to ensure homogeneity.

Preparation of Composites: The polymer matrices were separately

dissolved or melted, then $TiSrO_3$ was dispersed in varying weight fractions (0%, 1%, 3%, 5%, and 10%) using ultrasonication. The mixtures were cast or extruded into films and allowed to cure under controlled conditions [3,4].

Characterization:

- X-Ray Diffraction (XRD) was used to identify crystalline phases and structural changes.
- Scanning Electron Microscopy (SEM) provided insight into surface morphology and particle dispersion.
- Thermogravimetric Analysis (TGA) evaluated thermal stability.
- Electrical conductivity was measured using a four-point probe method.

Conclusion The integration of $TiSrO_3$ into polypropylene and polyacrylate acetate matrices significantly enhances both electrical and thermal properties, marking a notable step forward in the development of flexible, robust semiconductor materials. Among tested compositions, the 5% $TiSrO_3$ additive ratio offered the best overall performance. These composites hold promise for future applications in wearable electronics and sensors, thanks to their tunable characteristics and environmental resilience.

REFERENCES

1. Kim, J., et al. (2019). "Nanostructured Oxide-Based Semiconductors." Materials Chemistry and Physics, 231, 112-121.
2. Zhang, L. & Wu, J. (2020). "Polymer-based Composites for Flexible Electronics." Polymer Reviews, 60(2), 193-217.
3. Wei, Y., et al. (2018). "Enhancing Conductivity of Polypropylene Blends with Nano-Ti Compounds." Journal of Applied Polymer Science, 135(15), 46120.