

## Master / Research Thesis Project

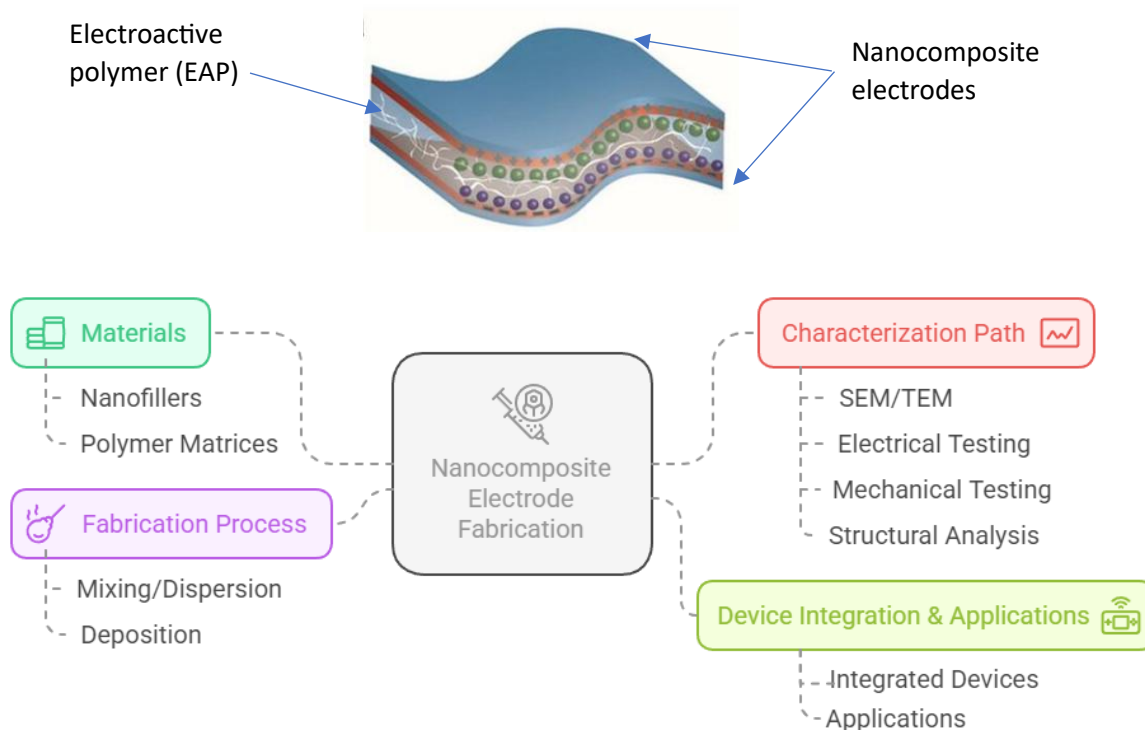
# Design, Fabrication, and Characterization of Flexible Nanocomposite Electrodes for Piezoelectric Nanogenerators and Actuators

### Project Description:

Flexible and robust electrode materials are essential for high-performance piezoelectric nanogenerators and actuators. The goal of this project is to develop a nanocomposite-based electrode that combines high conductivity, mechanical flexibility, and strong adhesion to piezoelectric polymer substrates (e.g., PVDF). By integrating nanofillers such as carbon nanotubes (CNT), graphene, or metallic nanoparticles (Ag, Au, or Cu) into a polymer matrix (e.g., PEDOT:PSS, polyurethane, etc.), the project aims to optimize the electrode for both energy-harvesting applications (nanogenerators) and actuation mechanisms (piezoelectric actuators).

### Key objectives include:

- Achieving consistent and reproducible electrode deposition on flexible substrates.
- Enhancing electrode performance (electrical conductivity, flexibility, stretchability).
- Ensuring reliability and long-term stability under mechanical strain or repeated actuation cycles.



## **Tasks:**

- Perform a comprehensive literature review to identify current trends, key challenges, and potential strategies for designing flexible nanocomposite electrodes.
- Obtain and prepare nanofillers and polymer matrices, ensuring proper dispersion and compatibility to form a stable electrode composite.
- Fabricate nanocomposite electrodes using techniques such as spin coating, screen printing, or spray deposition on flexible substrates.
- Conduct thorough electrical, mechanical, and structural characterization of the electrodes to assess their performance and suitability.
- Optimize electrode formulations and fabrication parameters through iterative testing and performance evaluation under relevant conditions.
- Analyze experimental data, document findings systematically, and compile the results into a coherent final report or thesis.
- Documentation of the work
- Report writing and presentation

## **Requirements:**

- Research and experimental skills
- Engineering background with knowledge of materials and nanocomposites
- Problem-Solving Abilities
- Self-learning, Initiative and motivation
- Flexibility and Adaptability

## **Supervisor:**

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