

## Industrial Consultancy & Sponsored Research (IC&SR)

### Hydrogenated Palladium Islands Decorated Thermally Exfoliated Graphene as Room Temperature Magnetic Material

#### IITM Technology Available for Licensing

#### Problem Statement

- **Limited Magnetic Properties of Graphene** restricts its use in spintronic magnetic devices.
- Existing **Ferromagnetic Graphene Synthesis Methods** face challenges in scalability, efficiency in achieving room temperature Ferro-magnetism.
- There is a need for **single-step, cost-effective, environment friendly approach** to synthesize graphene-based materials with strong room temperature ferromagnetic properties.
- **Palladium nanoparticles** have shown promise in enhancing magnetic response of graphene, but **efficient synthesis methods and optimized magnetic properties** are essential for use.
- Hence, this patent is disclosed that addresses the need for innovative synthesis methods **to produce highly magnetic graphene materials**, crucial for evolving spintronic sensors use in various fields.

#### Technology Category/ Market

**Categories:** Micro & Nano Technologies | Advance Material & Manufacturing

**Industry:** Advanced Materials, Nanotechnology

**Applications:** Spintronic, Magnetic Sensor, Biomedical Devices

**Market:** The global graphene market size was valued at **\$ 196 M** in **2023** and reach **\$ 1609 M** by **2030**. It is projected to grow at **35.1% CAGR** in the forecasted period of **2024-2030**.

#### Technology

The present disclosure provides a **single step method** of converting **few layered thermally exfoliated graphene (FLTEG)** into a highly ferromagnetic material with the introduction of palladium nanoparticles and hydrogen adatoms and demonstrates the **high magnetic responses**.

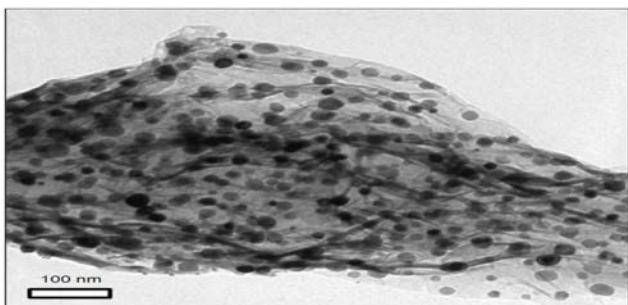


FIG. 1 shows TEM image of Pd-FLTEG.

#### Method

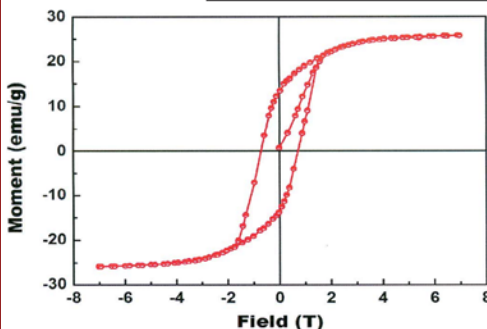
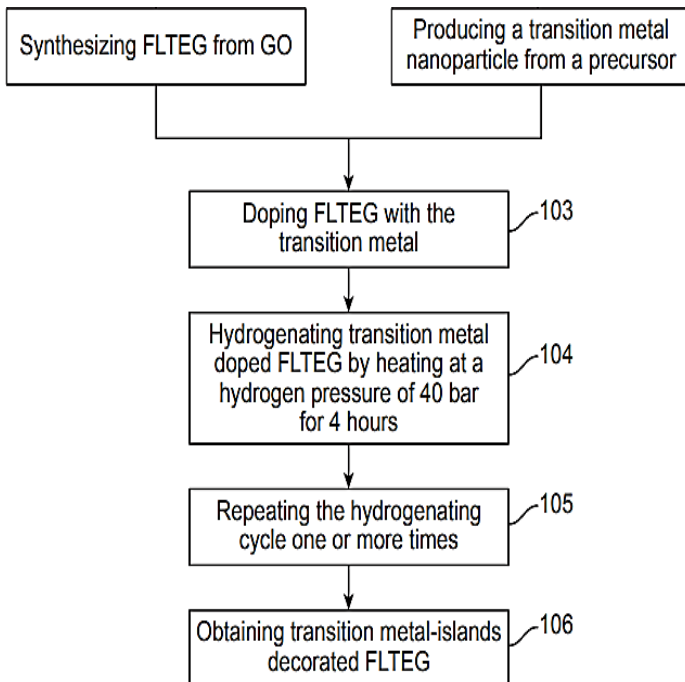


FIG. 2A illustrates a magnetization curve of Pd-FLTEG sample 1 using SQUID-VSM.

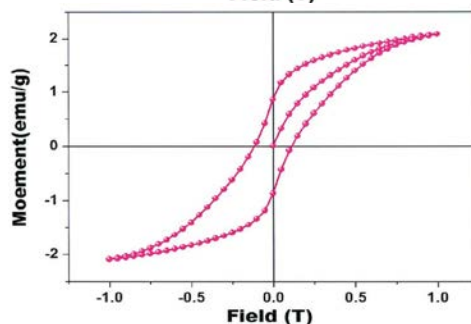


FIG. 2B illustrates a magnetization curve of Pd-FLTEG sample 3 using SQUID-VSM.

#### CONTACT US

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## Technology Transfer Office TTO - IPM Cell



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### Key Features / Value Proposition

#### User perspective:-

The technology offers graphene materials with significantly enhanced magnetic properties, enabling more efficient spintronic sensors and biomedical devices.

Users benefit from the versatility of the technology, which can be applied in various fields such as electronics, healthcare and data storage.

#### Industrial perspective:-

Industries can leverage the single-step, cost-effective synthesis method to produce highly magnetic graphene materials at scale, reducing production costs.

Companies gain a competitive edge by offering innovative and high-performance graphene products to meet the growing demand for advanced materials in the market.

#### Technology perspective:-

An innovative synthesis approach that efficiently add in palladium nanoparticle decoration onto few-layered thermally exfoliated graphene, resulting in superior magnetic properties.

The technology taps into the growing market demand for nanomaterials with enhanced functionalities, particularly in the fields of spintronics and biomedical applications.

### Research Lab

**Prof. Ramaprabhu S**, Department of Physics

#### TRL (Technology Readiness Level)

**TRL-4  
Validated in Laboratory**

#### Intellectual Property

IITM IDF No.: **1270**  
IP No.: **375214 (Granted)**

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