Graphene based composite as solitary platform for sensing devices

IITM Technology Available for Licensing

Problem Statement

- **Detecting abnormal levels** of dopamine, cholesterol, and glucose is crucial due to their **impact on health**, making it **essential to monitor them within specific ranges.**
- **Electrochemical sensors are popular** for their speed, cheap, ease, and sensitivity. **Graphene's properties** makes it a choice in these sensors.
- Graphene-metal oxides combination **improves sensor performance** for separate dopamine, glucose, and cholesterol detection.
- Yet, there's a **need for a material that detects all three at once on one platform**. Hence, there is a need of this patent disclosure.

Technology Category / Market

Categories: Chemistry & Chemical Analysis

Industry: Sensor Technology, Biomedical Devices, Diagnostics, Healthcare, Biotechnology

Applications: Medical diagnostics for measuring neurotransmitters (like dopamine), cholesterol levels, and glucose in blood, Wearable health monitoring devices, Laboratory equipment for biomedical research

Market: The graphene sensors Market was valued at **US$ 162.473 M** in **2020** & is expected to reach US**$ 1,142.008 M in 2027,** growing at a **CAGR** of **32.12%** from **2020-2027.**

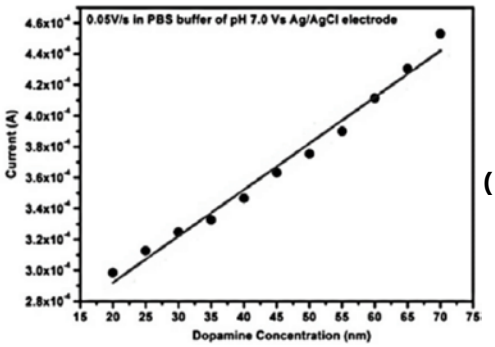
Technology

The present patent discloses a **Graphene based composite as solitary platform for sensing devices.** The Sensor technology represents a groundbreaking innovation in **healthcare and biomedical diagnostics.**

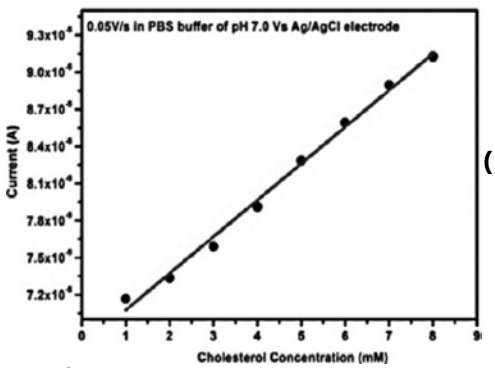
By harnessing the power of graphene-metal oxide hybrids, this technology offers **unparalleled capabilities** in **detecting vital biomarkers** like dopamine, cholesterol, and glucose within the human body.

It is a **game-changer**, **enabling precise and simultaneous measurement** of these components on a single platform, revolutionizing **healthcare monitoring and research practices**. This leads to a new era of accurate & accessible biomedical measurements.

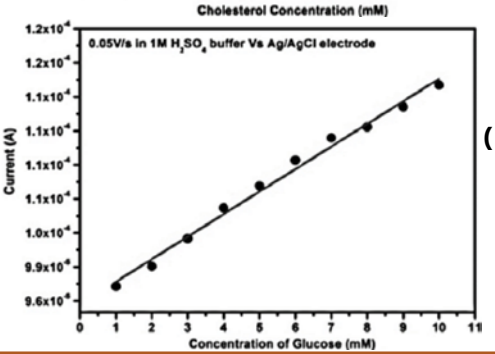
FIG.1. Shows the Plot of current Vs concentrations of Zn-SnO2 /NG hybrid nanocomposite modified electrode



(a) dopamine,



(b) cholesterol



(c) glucose.

Intellectual Property

IITM IDF No: **1475** | Patent No: **391850**
PCT No.: **PCT/IN2018/050435**

TRL (Technology Readiness Level)

TRL - 4, Experimentally validated in lab.

Research Lab

Prof. Ramaprabhu S
Department of Physics

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

IIT MADRAS
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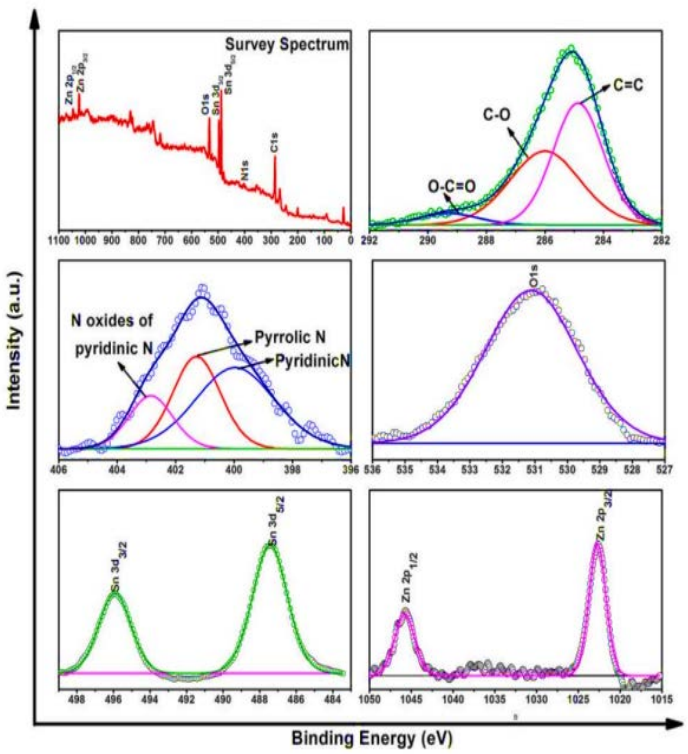
Method

A method for preparing a graphene based composite comprising steps of:

- **preparing Zn-SnO2 nanostructures by hydrothermal treatment using (Zn(CH3COO)2.2H2O & SnCl2.2H2O salts as precursor in a solvent containing ethanol & HCl,**
- **adding Zn-SnO2 nanostructures, ammonia and hydrazine hydrate to the GO (graphene oxide) dispersion,**
- **stirring the resulting dispersion at the room temperature, transferring it to a Teflon-lined autoclave & treating it hydrothermally.**

A graphene based composite for use in sensing of dopamine, cholesterol, and glucose in real time with error percentage of less than 2%.

FIG 2. shows XPS spectrum of **Zn-SnO2 /NG** hybrid nanocomposite.



Key Features / Value Proposition

❖ ***User Perspective:***

- Simultaneously detects dopamine, cholesterol, and glucose in **real-time** for **comprehensive health insights**.
- Same electrode can be **efficiently used** for sequential detections, **enhancing usability in clinical settings.**
- **High-accuracy, reproducible & correlation** with clinical data make it **a reliable tool** for **disease diagnosis and monitoring**.

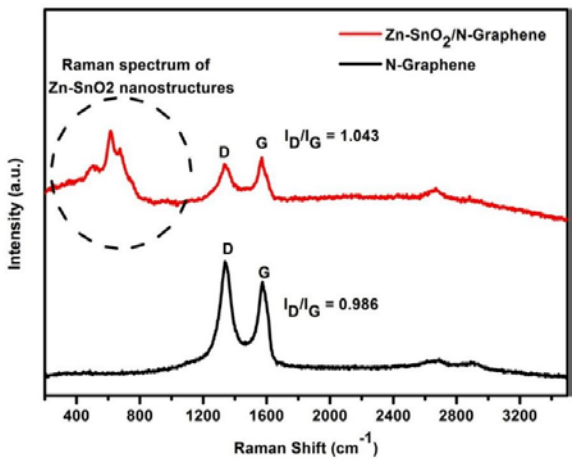
❖ ***Industrial Perspective:***

- **Fills a market gap** with **a cost-effective solution** for **three-component detection** in **healthcare and diagnostics**.
- Incorporation of metal oxide **boosts overall sensing performance,** positioning it as an **innovative solution** in **electro-chemical sensing technology.**
- **Ability to use the same electrode for multiple detections** contributes to **cost-effectiveness** for industrial applications.

❖ ***Technical Perspective:***

- Leverages **Graphene-Metal Oxide Synergy**, **overcoming limitations and enhancing electrochemical properties.**
- Hydrothermal synthesis ensures a **simple and reproducible manufacturing process, and maintaining consistency.**
- Demonstrates **high sensitivity & selectivity**, validated by comprehensive **characterization using various techniques**.

FIG 3. Shows Raman spectrum of **NG & Zn-SnO2 /NG** hybrid nanocomposite**.**



CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719