LCD-SUPPORTED THIN FILM GRAPHENE ELECTRODES

IITM Technology Available for Licensing

Problem Statement

- Generally, formation of graphene thin film electrodes involve coating of graphene oxide (GO) on to the **conductive support matrix** & subsequent reduction through electrochemical approach.
- Conventional patent and non-patent literatures have discussed supporting matrices which required **binders or linkers** to enhance the connectivity between graphene and supporting matrix.
- However, said prior arts do not disclosed the method of developing an electrode with a conductive thin film graphene based layer without any binder or linker.
- Hence, there is a need to mitigate above challenges & provide **efficient solution**.

Technology Category/ Market

Technology: LCD-supported thin film graphene electrodes;
Industry: Sensors, Environmental Engineering;
Applications: Advanced Materials, Opto-electronic device;
Market: The global **graphite electrode** market is projected to **$12.79B** by **2032**, at a **CAGR** of **10.3%** during 2022-**2032**.

Intellectual Property

IITM IDF Ref.:1597; IN Patent No. 415489

TRL (Technology Readiness Level)

TRL- 4: Technology validated in Lab

Research Lab

Prof. Indumathi M Nambi,
Dept. of Civil Engineering.

Technology

- Present Patent discloses a **binder-free, linker-free** thin film electrode for use in a **cell** for **removing contaminants** from water.
- Further, subject patent discloses **a method of fabricating** a binder-free, linker-free thin film electrode for use in a cell for removing contaminants from water.
- The electrode is being fabricated from a **liquid crystal display (LCD) touch screen panel,** wherein the electrode is configured with a **conductive thin film graphene based layer**.
- Patented Method is projected in the flowchart shown hereinbelow:

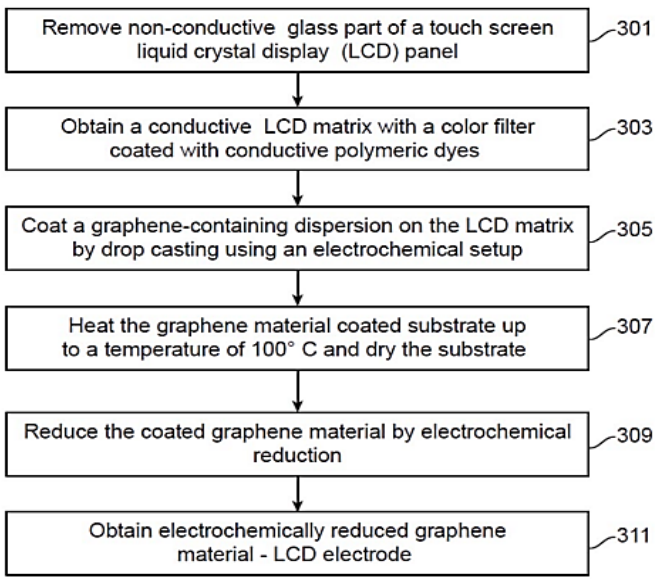

FIG.1:Depicts a method of fabricating a binder-free, linker-free thin film electrode from a touch screen LCD panel.

- In discussion with the above process, a **thin film coating** over the substrate is obtained **without** the addition of binders or linkers.
- **Coating thickness** is in range of 50-100nm.
- Said LCD touch panel matrix assembly is configured with **multiple layers** including a **top conductive layer**, a **second black matrix layer**, a **third ITO layer**, and a **bottom glass layer,** shown in Fig. 2.
- Furthermore, a **method of treating contaminated water** using said electrode is disclosed.

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

Industrial Consultancy & Sponsored Research (IC&SR)

Image

FIG.2A depicts a binder-free, linker-free thin film electrode; **FIG.2B** depicts an electrochemical setup to treat the contaminants in water using electrode.

FIG.2A:

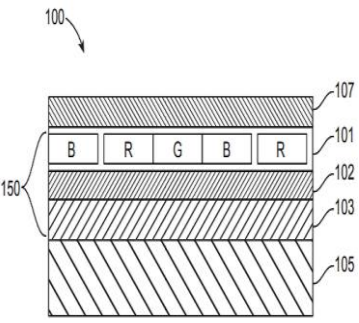

FIG.2B :

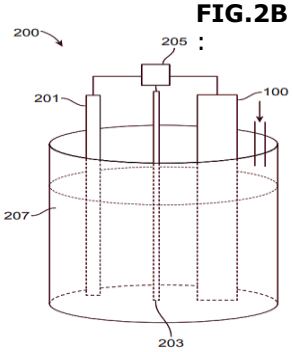

FIG.3A & FIG.3B: depicts **SEM analysis** of conductive LCD surface & **graphene oxide coated LCD;**

FIG. 3A

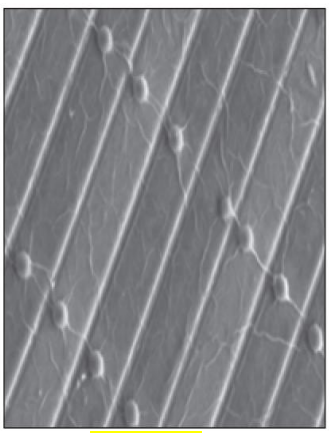

FIG. 3B

Experimental Results

FIG. 4A: Illustrates H_2O_2 production using various electrodes; **FIG. 4B** depicts the H_2O_2 production rate with respect to power consumption and varying applied voltage at pH 3.5 in Graphene/LCD electrode;

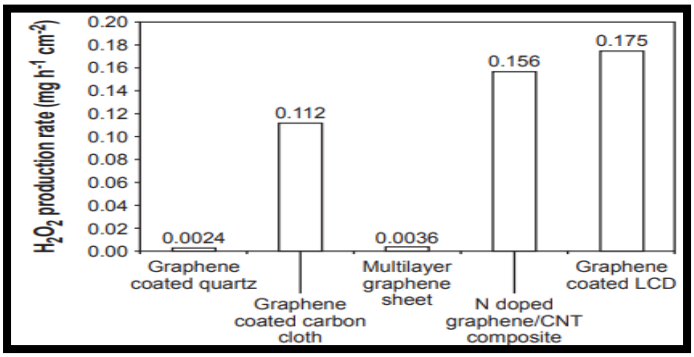

FIG. 4A

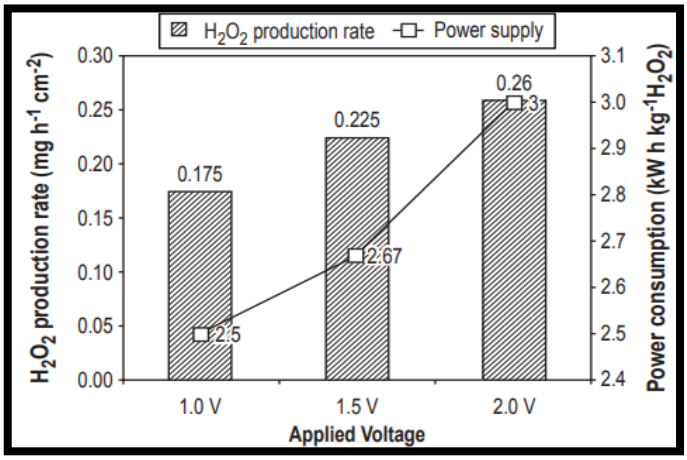

FIG. 4B

Key Features / Value Proposition

❖ *Technical Perspective:*

- **Simple and Facile way** for the formation of cost-effective **binder/linker free** thin film graphene electrode.
- **Conductive polymeric dyes** present on the **surface** of the **LCD enhance**s the attachment of graphene oxide(GO) & act as electrochemical platform for the **electrochemical reduction** of GO. (Refer Figs. 3A & 3B)
- GO was drop casted onto LCD support matrix and dried to form **uniform thin film.**
- The **eco-friendly electrode** is electrochemically reduced & is characterized by amine, amide or aromatic C-H bonds between the polymeric dye layer and the graphene.

❖ *Industrial Perspective:*

- Provides **a sensor** for the **electrochemical detection** of **contaminants in water.**
- Facilitates a **cost-effective sensor** & also **photovoltaic cell** applications.

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