



IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

ACCELERATED MACHINE-LEARNING-BASED SYSTEM AND METHOD FOR PREDICTING APPROPRIATE MATERIALS AND RAPID PROTOTYPING OF ENERGY-STORAGE DEVICES

IITM Technology Available for Licensing

PROBLEM STATEMENT

- Globalization and customization are putting pressure on manufacturers to create prototypes for design changes, especially in energy-efficient products.
- The storage device industry needs flexible upgrades and rapid prototyping to meet evolving needs.
- The energy storage industry is utilizing advanced computing tools like CAD systems and artificial intelligence for rapid prototyping applications.
- However, rapid development is needed for materials discovery and implementation.
- A combination of data science, robotics, 3D printing, testing, and database management is crucial for successful development.
- An enhanced AI-based machine learning system is required to meet demands.

TECHNOLOGY CATEGORY MARKET

Technology: Predicting appropriate material for rapid prototyping devices

Category: Artificial intelligence-based machine learning systems and methods

Industry: Material Science

Application: Energy Storage/Rapid prototyping systems and applications

Market: The global market size was USD 700 million in 2019 and is poised to grow from USD 749 million in 2023 to USD 1131 million by 2031, growing at a CAGR of 7% in the forecast period (2024-2031).

INTELLECTUAL PROPERTY

IITM IDF Ref. 2019 ,Patent No: IN 495621

TRL (Technology Readiness Level)

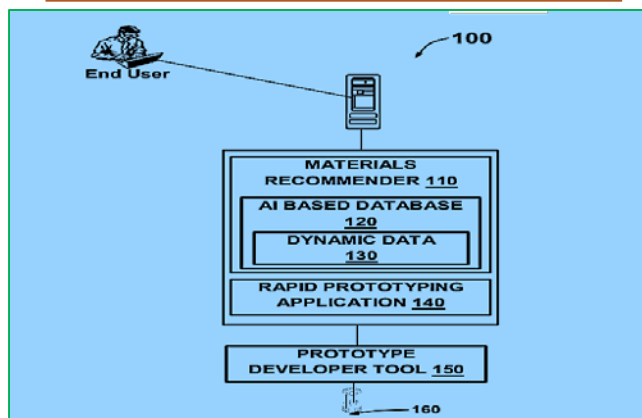
TRL-2, Technology concept formulated;

Research Lab

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TECHNOLOGY

Accelerated machine-learning-based system



- An accelerated machine-learning-based system, comprises:
- A materials recommender module (110) configured with an AI (Artificial Intelligence)-based dynamic materials database (120)
- For putative optimum composition and identification of appropriate material recommendation with respect to an end user specification; and
- A rapid prototyping application (140) configured with a prototype developer tool (150)
- For receiving the appropriate material recommendation and rapid prototyping of energy-storage devices (160) based on end-user specifications
- wherein the accelerated machine learning-based system (100) predicts appropriate/discovering materials and rapid prototypes of energy-storage devices based on end-user specifications.

CONTACT US

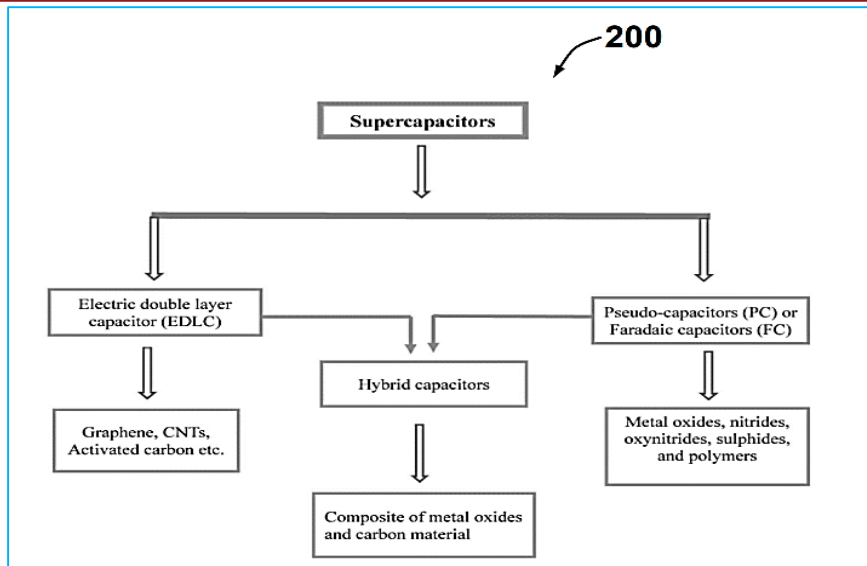
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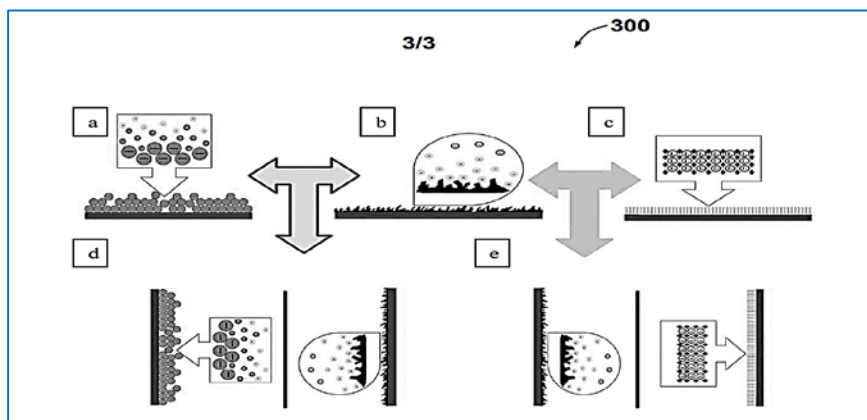
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- FIG.1 illustrates **exemplary embodiment**
- Different **classes of materials** from **machine-learning-based system (100)**.



- FIG.2 shows **exemplary embodiment**
- Different **varieties of charge-storage techniques** possible from **machine-learning-based system (100)**.

Key Features / Value Proposition

Why selection of material is important to deliver a user required product.

- For **example** supercapacitors are known for their **rapid energy delivery** (1-2 kW kg⁻¹) and **quick charging time** (4-10s) based on the material used.
- Based on the material used as an electrode material, a **supercapacitor exhibits**
 - **electrical double-layer,**
 - **pseudocapacitive,**
 - **hybrid behavior.**
- Hence, the **selection of material is important** to deliver a user required product.
- **AI-based support system** comprises
 - an accelerated material discovery setup
- **Rapid prototyping devices**
 - Based on **end-user specifications.**
- The **database** would be **updated continuously with the results** we achieve through the system iteratively.
- The **prototype developer tool**
 - Comprises a **3D printer** or a robot system.

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