An Organic Nanofluid for Cooling of Battery Stack and a Method of Manufacture thereof

IITM Technology Available for Licensing

Problem Statement

- The existing problem revolves around the **insufficiency** of current cooling solutions for battery stacks in electric vehicles (EVs).
- The inefficiency of **conventional coolants** results in **reduced overall efficiency of EVs,** leading to **shorter mileage & less environment friendly operation.**
- EVs face challenges in maintaining **battery stack** within **optimal temperature range**, affecting performance & efficiency.
- In **sub-zero temperature regions** i.e., the Himalayan region, EVs face difficulties due to **lack of suitable cooling solutions.**
- Conventional coolants often lack the necessary **thermophysical properties**, like thermal conductivity & specific heat capacity, required for **effective cooling**.
- Vapor pressure also plays a crucial role in the **single-phase operation** of coolants, and this issue needs to be addressed.

Hence, there is a need for a **highly efficient and versatile cooling solution** for battery stacks in EVs, and this invention aims to address above mentioned shortcomings.

Technology Category/ Market

Automobile & Transportation, Green Tech

Industry: Electric Vehicles (EVs), Battery Technology, Automotive Industry, Renewable Energy Storage, Electronic Devices.

Applications: EV Charging Infrastructure, Battery Trade, Renewable Energy & Grid-Scale Energy Storage, Off-Grid/ Remote Locations, Sustainable & Green Building Technology

Market: The global **electric vehicle (EV) battery** market size was estimated at **$ 44.69 B in 2022,** expected to grow with **21.1% CAGR** in **2023-30.**

Research Lab

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Intellectual Property

IITM IDF Ref. 2369; IN Patent No. 452212

TRL (Technology Readiness Level)

TRL- 4, Technology validated in Lab

Technology

The present patent discloses an **organic nanofluid coolant, combining deep eutectic solvent (DES) and nanoparticles**, to efficiently cool battery stacks in EVs and various industrial applications, offering enhanced performance & sustainability.

❖ ***Method*:**

- Preparing a mixture of diphenyl ether & Dibenzyl ether in a container fitted with condenser to obtain a deep eutectic solvent.
- Adding one or more amount of hexagonal boron nitride (h-BN) nono-powder to the deep eutectic solvent to obtain a nanoparticle enhanced deep eutectic solvent

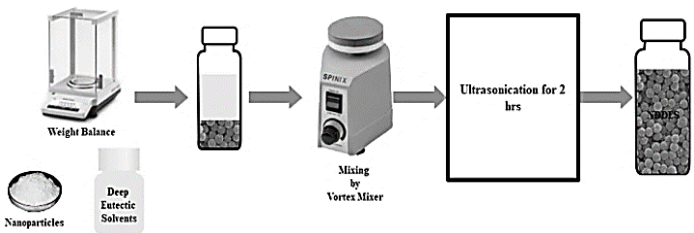

FIG. 1 shows schematic view of lab scale NEDES synthesis.

Key Features / Value Proposition

❖ ***User Perspective:***

- **Enhanced EV Performance:** improved efficiency and range. Reduces emissions & supports a cleaner environment.
- **Ensures battery reliability and safety** with biocompatible materials.
- **Versatile in Various Climates:** Works well across a wide temperature range.

❖ ***Technology Perspective:***

- **Nano-enhanced Cooling**: Utilizes nanoparticles to boost thermal properties.
- **Deep Eutectic Solvent (DES):** Leverages DES as a base fluid for its unique properties.
- **Eco-Friendly:** Complies with environmental standards for sustainable cooling.

❖ ***Industrial Perspective:***

- **Versatile Industrial Use**, offering cost-effective and efficient cooling.
- **Energy Efficiency:** Reduces energy consumption and minimizes downtime.
- **Scalable Solution:** Suitable for mass production and widespread industrial adoption.

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