

A DEVICE TO DISPLACE AND REMOVE LIQUIDS FOR THERMAL AND HUMIDITY MANAGEMENT AND A METHOD THEREOF

IITM Technology Available for Licensing

Problem Statement

- The concept of liquid removal from a horizontal surface and the harness of liquid are important factor in space application to maintain the perfect operation.
- In the **existing condenser**, the condensates had removed by external force or gravity and such a mode of removal was **impossible** for **horizontal orientation surface** under **micro gravity conditions**.
- In space application, maintenance of humidity and temperature of the international space station or space shuttle is necessary and important.
- Further, the **increase in humidity** was causing **water accumulation on electronic devices**, inside the space shuttle which further leads to **short circuit** and the possibility of **igniting a fire**.
- Furthermore, **warm** and **high humidity conditions** can lead to the growth of **micro-organisms** within the space station, and human gets sick after inhaling those microorganisms.
- Therefore, there is a need for a device and method to address above issues.

Technology Category/ Market

Chemical- Condenser, heat pipes;

Electronics- Cooling system for Processors inbuilt in tablets and mobiles;

Industry- Testing Equipment i.e. Condenser used in Space applications, cooling devices used in Tablets, Mobiles;

Applications-Horizontal or inverted oriented Condenser, **Condenser** for Space applications for Humidity and Thermal Management, Environmental Control Applications, a **two-phase cooling device**, a **spray cooling system** for thermal management, and Cooling System for Processors inbuilt in tablets, mobiles;

Market-The global thermal management market was valued at USD 10.7 billion in 2022 and is projected to reach **USD 19.3 billion by 2028**, a CAGR of **9.7%** during the forecast period.

Technology

- The present invention relates to a platform and method for thermal and humidity management in condensation application.
- The claimed platform (or a device) and method are used for removing the liquids without any external force or gravity.
- The device comprises a **substrate** and a **wicking reservoir** for displacing liquids and removing the liquids
- The substrate comprising a wettability patterned surface which comprises of one **super hydrophobic region** and the **liquid displacement** occurs due to **surface forces** resulting from the wettability patterned surface.
- The wicking reservoir is placed around the surface in such a manner, that the **liquid displaced to outer edges of the substrate** is **absorbed** by the wicking reservoir.
- Further a method for designing and fabrication of said platform is claimed in the invention.
- FIG. 1(a) and FIG. 1(b):** Illustrates a platform or device to remove liquid without any external force

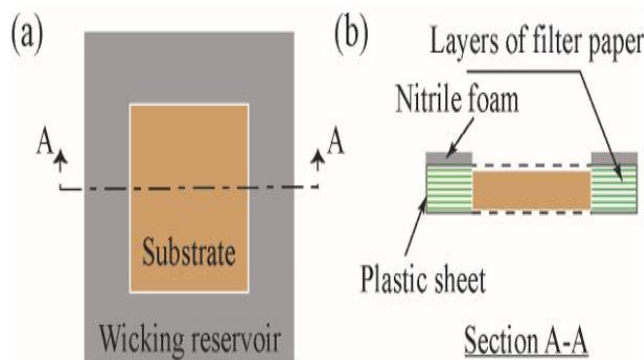


Figure 1: Schematic of the proposed platform.

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Intellectual Property

IDF Ref: 2308; IN 202241019050

Key Features / Value Proposition

- The present invention is achieved a complete passive displacement of liquids on the platform.
- The platform can be displaced and removed liquids continuously from the platform surface **without flooding the liquid** in the **horizontally oriented surface** or a surface.
- The **effective exchanged of heat** can be accomplished with the surrounding fluid media in the surface.
- The surface comprises **super hydrophilic patterns** laid on a **super hydrophobic or hydrophobic** background.
- The platform and method are used for **removing the liquids** without any external force or **zero-gravity condition**.
- Important element i.e. the wicking material is placed surrounding the substrate in order to **absorb** the accumulated liquid from the **side edges** of the **surface**.
- The **absorbed liquid** from the **wicking material** can be **displaced or stored to other locations** and the displaced liquid can be **recycled** for different purpose.
- Excellent features are discussed on **thermal and humidity management** for condensation application, applicable in space application like space shuttle.
- The condensation experimental test results are shown herein to provide more clarity.
- FIG: 2A** and **2B** Illustrates time lapse images of condensation test on the substrate for pattern P1 and pattern P2.

TRL (Technology Readiness Level)

TRL- 3 Proof of concept Stage

Research Lab

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Images

FIG: 2A

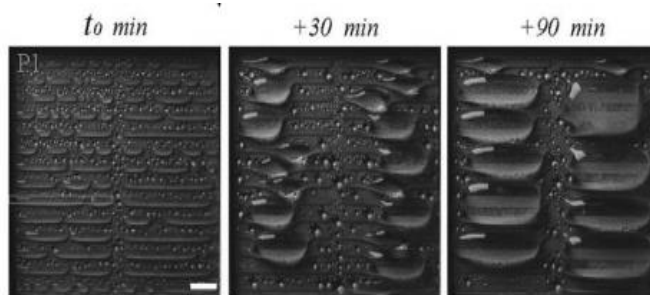
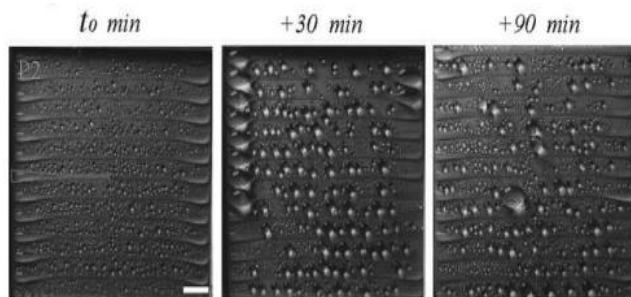


FIG:2B



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