Area-enhanced hydrogel for evaporative cooling

ETA-Lab
Energy Transport Advances

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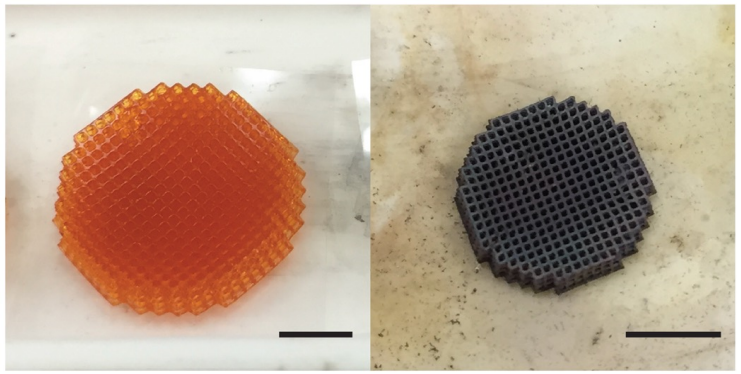
Context

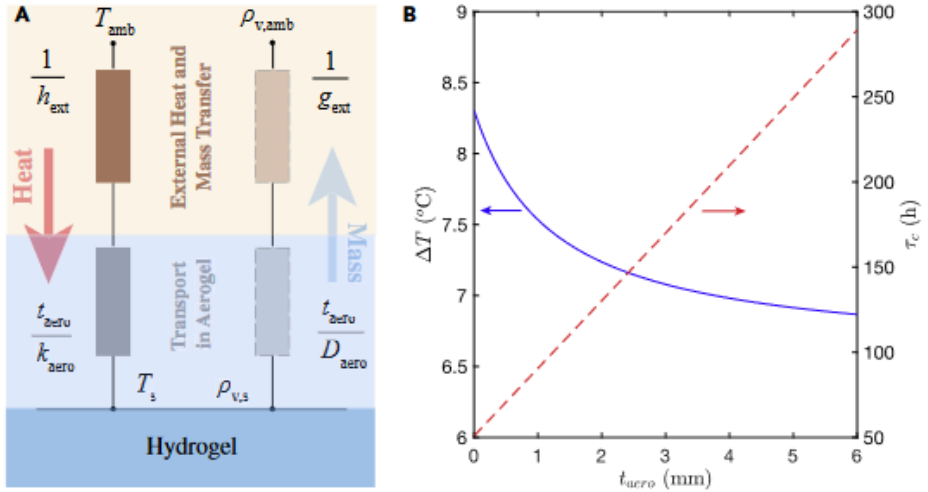
- Passive evaporative cooling can operate without grid access with low carbon footprint
- **Architected hydrogels** greatly improves vapor transport and enhances cooling performance



D. Yee et al., Adv. Mater. Technol. 2021, 6, 2000791

Objectives and Methodology

- Design and modeling of evaporative cooling performance of architected hydrogels
- 2.5-3D hydrogel optimized for evaporation
  - Molding/Additive manufacturing
  - Characterization of cooling performance



Z. Lu et al. Joule 4, 2693–2701 (2020)

Nanoengineered surfaces for boiling heat transfer

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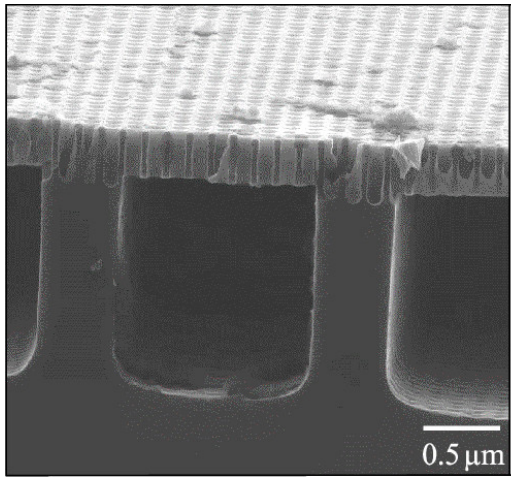
- **Context**
  - Boiling: a phase-change phenomenon with broad applications:
    - **thermal management**, **steam power generation**, and **nuclear reactor cooling**.
  - Simultaneously improving **boiling efficiency** and **maximum heat flux** remains a challenge.
  - Our goal is to leverage **nanoengineered** surfaces to enhance boiling heat transfer
- **Objectives**
  - fabrication of nanoengineered surfaces
  - characterization of the boiling curve on a flat/structured surface
  - understanding the effect of nanoengineered surfaces on heat transfer enhancement.
- **Methodology**
  - Design of boiling heat transfer setup
  - High-speed imaging.
  - Calibration and usage of resistive temperature detector
  - Image processing using MATLAB/Python
  - General knowledge of micro/nanofabrication.
  - Communication of research (through writings and slide presentation)

Boiling phenomena
Image credit: Y. Song



Nanoengineered surface
DF Hanks & Z. Lu et. al.,
ACS AMI 2020