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Electrowetting Heat Pipe Development

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20th September, 2019

Motivation and Context

- Partnership with the University of Texas at Austin.
- Development of novel heat pipe technology for multiple, disruptive, energy-related applications.

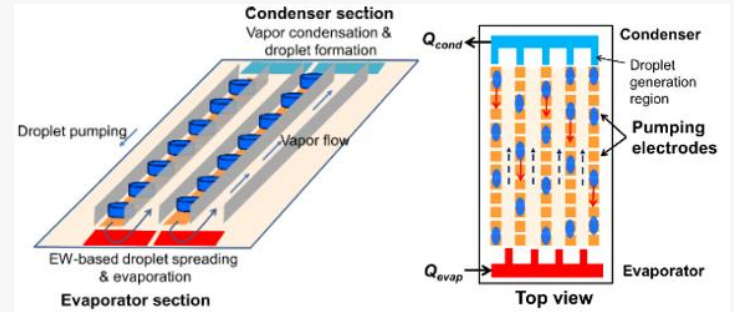


Objectives

- System idealization and modelation
- Experimental setup – University of Texas
- Heat Flux Data acquisition – University of Texas
- Experimental setup with applied electrical field - Pedro Santos
- Numerical Simulation - Eduardo Freitas and University of Porto
- Testing with Nanofluids - Eduardo Freitas

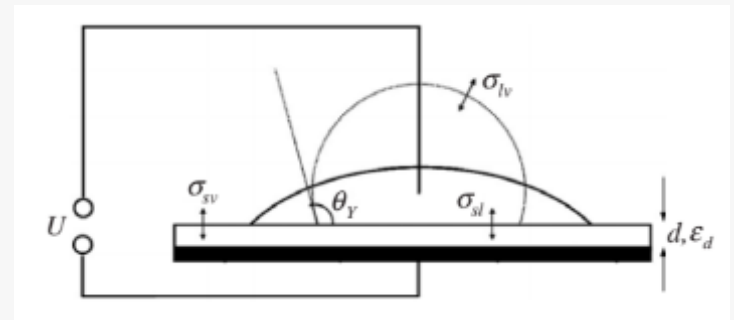
So...What is a Heat Pipe?

- Passive heat transfer device;
- Heat absorption at the evaporator and heat rejection at the condenser (heat sink);



Problem - Heat transport capacity degrades rapidly with length.

Possible Solution - Manipulate the transport using the Electrowetting phenomena.



Applications

Refrigeration systems in many areas, such as:

- CPU processor refrigeration;
- Solar;
- Electric Cars battery refrigeration;

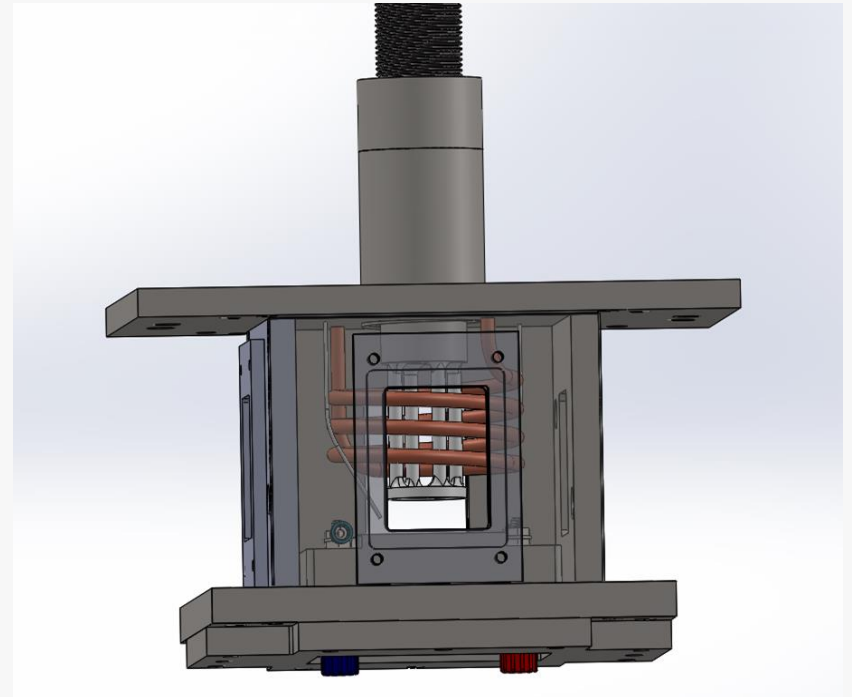
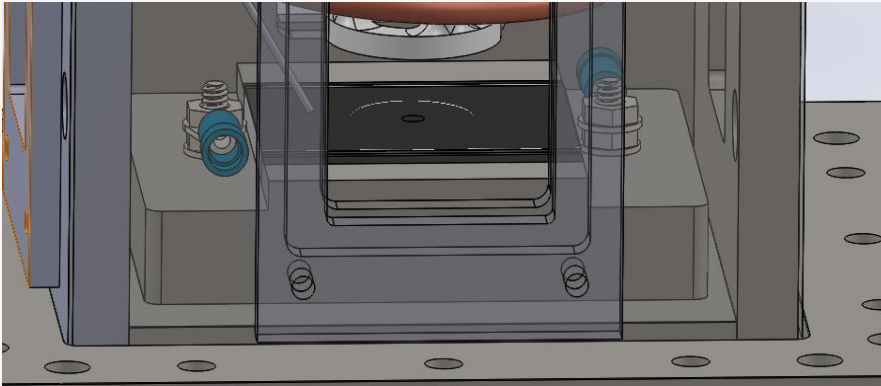


Electric Cars battery refrigeration:

- Optimization of the working temperatures;
- Increasing lifespan of the batteries;

Experimental Setup with Electrical Field

- Biphilic surface;
- Bubble Dynamics;
- Bubble interference;



Nanofluids

- A nanofluid is a combination of a base fluid (like water) and nanoparticles – with diameter between 1 and 100 nm;

Objetives:

- Study different types of nanofluids;
- Compare the bubble dynamics results to the ones of pure water;
- Analyze the possible heat transfer enhancement obtained;
- Validate with numerical simulations (*OpenFOAM*);

