Department of Aerodynamics and Fluid Mechanics
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Offer of Master Project

DEPIK – TEHD: Evaluation of the heat transfer in a rectangular cavity subjected to an alternative electric field using heat flux sensors

Project description:
In order to enhance heat transport between a hot and cold surface, a strong electric field can be used on a dielectric fluid. A convective heat flux may result from the flow induced by the electrohydrodynamic (EHD) force. The improvement of heat transfer is one of main interests for the design of future heat exchangers that would be effective for small systems in any orientation and in addition has no moving parts (fans, pumps …). In particular, heat exchangers based on the EHD effect could be efficient under microgravity conditions, where the classical Archimedean buoyancy does not play a role.

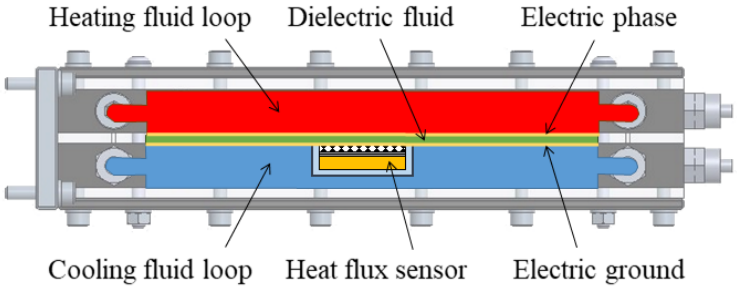

Figure 1: Schematic representation of the rectangular cavity with applied temperature difference and electric field. The heat flow sensor is located at the outer side of one of the cavity wall within the fluid loop.

The present Master project aims to test and validate measurement techniques to measure efficiently the rate of heat flux through one of the plate electrodes of the system shown in Figure 1. That system consists of a dielectric fluid confined between two plane electrodes maintained at different temperatures. A heat flux sensor is positioned at the outer side of one of the cavity wall and needs to be tested in the presence of a strong alternative electric field.

We are looking for an engineering or physics student to perform laboratory experiments and data processing. The candidate will get to familiarize with the scientific research process by experimenting, post-treating data, analysing and discussing their findings. The topic is closely related to fluid dynamics under microgravity research, and the results might be used in the framework of Parabolic Flight Campaigns and of Sounding Rocket (TEXUS) flight.

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