Grand Technion Energy Program
תכנית האנרגיה ע"ש גרנד

TECHNION Israel Institute of Technology

תכנית האנרגיה ע"ש גרנד מתכבדת להזמינך להרצאה סמינריונית שתינתן ע"י:

אבשלום אופנר

התכנית הבין-יחידתית לאנרגיה

בנושא:

Heat and Mass Transfer in Acoustic Energy Conversion

Low-temperature heat, abundantly available as industrial exhaust streams or non-concentrated solar radiation, is a largely underutilized energy source. Due to intrinsic irreversibilities, the efficiency of converting this heat to accessible power is low, requiring a robust, scalable, low-cost technology to face this challenge. Thermoacoustic devices – machines converting heat to mechanical power in the mean of high intensity sound waves from which accessible energy may be harvested – provide a highly reliable, simple (and therefore cheap) alternative to tapping this heat. Over the past two decades multiple modifications to existing systems were shown to reduce the temperature difference required for operation dramatically, thus adapting them to waste-heat recovery needs. These modifications, however, reduce the efficiency and increase system complexity (and price).

The present work suggests a different path towards meeting all the above criteria: we introduce a gas mixture containing a 'reactive' gas, able to exchange mass with a solid boundary, such that most heat is transferred at constant temperature, through latent heat. The vast amount of energy associated with the (nearly) reversible process of phase transition can both limit the temperature range in the system, and increases the overall efficiency. We constructed an apparatus and demonstrated the first stable operation of such a system, employing an air-water vapor mixture. The results validated the above hypotheses, revealing an increase in power production alongside a decrease in temperature. We derived theoretical models to investigate the underlying mechanisms through which such 'phase-exchange' systems outperform their equivalents. The theoretical results are in good agreement with experimental measurements.

מנחה: פרופ"מ גיא רמון, הפקולטה להנדסה אזרחית וסביבתית

במסגרת עבודת מחקר לתואר דוקטור

ההרצאה תתקיים ביום ד', 19.06.19, בשעה 12:30,
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