10. Thermoacoustic Energy Harvesting and Refrigeration

Introduction: Thermoacoustic technology provides a novel approach for harvesting thermal energy from various sources such as industrial waste heat, solar energy, and geothermal energy by exploiting the thermoacoustic effect that converts heat into acoustic waves using no/fewer moving components and no toxic chemical refrigerants. Thermoacoustics is an interdisciplinary subject that studies the energy conversion between an oscillatory compressible fluid and a still porous material. In thermoacoustic engines, an appreciable temperature gradient is imposed along the porous material that initiates spontaneous acoustic oscillations. Further integrating the thermoacoustic engine with an acoustic-to-electric transducer (e.g. piezoelectric transducer, electrostatic transducer, triboelectric nanogenerator, etc.) can realize the energy conversion from heat into electricity. On the other hand, acoustic waves produced by thermoacoustic engine can also be used to produce refrigeration or pump heat, leading to thermally-driven thermoacoustic refrigerators or heat pumps.

This Special Session is dedicated to the latest advances in thermoacoustic energy harvesting technologies either for electricity generation or for refrigeration purposes. It provides a unique platform to present state-of-the-art research findings in the thermoacoustic field and aims to promote innovative solutions associated with the practical applications of thermoacoustic devices including thermoacoustic engines, energy harvesters/electric generators, refrigerators/heat pumps/cryocoolers, etc. Contributions that investigate thermoacoustics-related issues in sound and vibration, thermal science, or materials/energy science, using theoretical, numerical, or experimental methodologies, from component to system levels, are welcomed.

Topics:

- Thermoacoustic engines, power generators, and energy harvesters;
- Thermally-driven thermoacoustic refrigerators, coolers and cryocoolers;
- Linear alternators, piezoelectric transducers, electrostatic transducers, triboelectric nanogenerators, bidirectional turbines, etc., for acoustic energy harvesting;
- Thermoacoustic metamaterial;
- Thermoacoustics in solids;
- Components in alternating flow systems, such as heat exchangers and regenerators;

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