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Impedance adjustment method study of thermo-acoustic electricity generator without resonator

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Thermo-acoustic electricity generator is an application of thermo-acoustic technology. Occasionally, thermo-acoustic electricity generator without resonator should be used to satisfy both small scale and high efficiency. The alternator is resonance element as well as consuming power element. Compared to an acoustic resonator, the mechanical impedance is more concentrated, causing more apparent performance change when the impedance changes. The impedance is fixed when the linear alternator is built. In order to attain an easy performance adjustment method, we investigated the effect of an additional impedance to the whole machine performance. The theoretical analysis of thermal-to-acoustic and acoustic-to-electric performance was made as acoustic impedance at the output port of thermo-acoustic engine is changed. A series of impedance adjustment parts were designed and tested. Results showed that it could improve about 8% thermal-to-electric conversion efficiency and 18% electric power output in our thermo-acoustic electricity generator. Further experimental results showed that the dimension and the position in the acoustic field intensively affect the performance of the system.

Primary author: Dr LI, ZhengYu (Technical Institute of Physics and Chemistry,CAS)

Co-authors: Dr ZHOU, Gang (Technical Institute of Physics and Chemistry,CAS); Prof. LI, Qing (Technical Institute of Physics and Chemistry,CAS)

Presenter: Dr LI, ZhengYu (Technical Institute of Physics and Chemistry,CAS)

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