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Experimental studies on traveling wave thermoacoustic prime mover driven at the resonator end

Thermoacoustics is a promising environmentally friendly technology with growing interest in research by its advantages, such as absence of moving parts, use of environmental-friendly working fluids and the possible use of waste heat energy. Here we present the experimental studies on a traveling wave thermoacoustic engine driven at the resonator end by a prime mover with parallel plate stack. Experiments have been carried out with different resonator lengths from 0.5 m to 2 m, using the working fluids Helium, Argon and Nitrogen in the operating pressures ranging from 0.1 to 0.5 MPa. Among the different fluids investigated, the operating frequency is the highest for helium and the lowest for argon and intermediate for nitrogen. It is observed that the pressure amplitude increases with increase in resonator length upto a certain value and then decreases. The maximum pressure amplitude is observed with nitrogen as the working fluid for the resonator length of 1.0 m at 0.5 MPa. The results indicate that the choice of the working fluid with the right operating pressure is critical to the performance of the system. The detailed experimental studies of the above system are presented in this work.

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