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Scalability of Thermoacoustic Refrigerator

Ehab Abdel-Rahman

The American University, 211 Science Building, 113 Kasr El Aini St., P.O. Box 2511, 11511 Cairo, Egypt

The uses of thermoacoustic effect are the conversion of heat onto acoustic wave by thermoacoustic prime mover and pumping heat by acoustic wave using a thermoacoustic refrigerator. Thermoacoustic refrigerator is a good alternative to conventional vapor compression device. It can be very compact, using a minimum of uncomplicated, economical components. It can also provide variable cooling capacity and scalability to different sizes in ways that conventional vapor compression technology is not capable of. We are investigating the minimum size of a thermoacoustic refrigerator that can meet the cooling requirement for different applications. The coefficient of performance (COP) of small thermoacoustic refrigerators is in the range of 20% of the ideal (Carnot cycle) COP, which is actually better than similarly scaled vapor compression coolers which is at about 10%. The efficiency of thermoacoustic refrigerator can be improved by better designing of its components. In this paper the effect of components design on the performance of thermoacoustic refrigerator is discussed. The scalability of such devices is also investigated.