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THERMODYNAMIC STUDY OF MINIATURE ROTARY INTEGRAL STIRLING CRYOCOOLER

Content :

Miniature rotary integral stirling cryocooler refers to class of cryocoolers weighing below 1kg and provides cooling below 1W, the rotary integral cryocooler works on governed piston and displacer. In such cryocoolers regenerator plays a significant role in determining the effectiveness of the cryocoolers. In this paper output parameters temperature, cooling lift, and work of a 500 g cryocooler with 0.5W heat lift at ambient conditions whose input were studied for different geometries, materials and arrangement of the regenerator. The numerical studies were performed on one dimensional model of the entire cryocooler, in the regenerator section the axial and longitudinal heat losses were considered together with regenerator in effectiveness, shuttle losses, leakage losses, gas conduction losses, regenerator casing conduction and cold finger conduction losses. Different materials were stacked together and their performance was analyzed numerically, for different order of materials and geometries and their overall effects on the miniature rotary integral stirling cryocooler were studied. The PV plot of the Helium is obtained for an entire cycle at different points within the system.

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