26th National Symposium on Cryogenics and Superconductivity

Contribution ID : 35

Analysis of sintered porous regenerator of Stirling cryocooler using numerical technique

Content :

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The regenerator is the key element of Stirling cycle cryocoolers and performance of the regenerator directly affects the cryocooler performance. Regenerator is a compact periodic heat exchanger in which the fluid is in direct contact with the solid heat transfer area. Thus, it is essential to have an idea about regenerator geometry, parameters and their effects on the system. Porous materials type regenerator of the existing Stirling cycle cryocooler is considered. Porosity is one of the parameter which determines the thermal and flow characteristics of regenerator and thus its performance. Predicting the porosity by analysing sintered regenerator is the aim of the project. Assuming the mass flow rate through the regenerator as constant, energy equations for matrix and helium gas working fluid is studied. Using the energy balance and continuity equation, matrix and fluid thermal equations are derived. CFD simulation has been carried out using ANSYS 16.0 and the porosity of the regenerator is predicted using the REGEN 3.3 Numerical Analysis Software for Regenerators. The obtained results are compared with the results of open literature.

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Session classification : Poster Session 2: Abstract ID 11,33,34,35,36,38,39,40,43,48,52,54,59,66, 67,70,71,78,88,89,90,92,94,100,102,105,107,108, 109,111,112,115,116, 120,121,124,125,127,128,129,131,190

Track classification : Cryocoolers / Cryopumps / Cryogenics Systems

Type : --not specified--