Contribution ID: **1043** Type: **Contributed Oral Presentation**

C1Or1C-03: A Second Law Study of the Regenerators in Cryocoolers based on Pore-level Analysis of Entropy Generation

Monday, July 22, 2019 11:30 AM (15 minutes)

Regenerators are key components of pulse tube cryocoolers and losses in regenerators have a significant effect on the performance of cryocoolers. In previous studies, the efficiency of regenerators have been characterized mostly based on the first law of thermodynamics, and second-law analyses have been based on exergy considerations or irreversibility associated with macroscopic flow models. In this work, we investigate the entropy generation in regenerators based on detailed pore-level simulations. Computational Fluid Dynamics (CFD) simulations are used to model two-dimensional regenerator geometries, and examine the microscopic flow and heat transfer phenomena that cause irreversibility. Important geometric and flow parameters, including porosity, pore size and pore geometry, are studied parametrically. The results indicated that geometric and flow parameters have a very significant effect on the relative scale of entropy generations due to viscous dissipation and temperature gradient. Some possible methods that may reduce entropy generation and improve the overall efficiency of regenerators are also suggested.

Primary author: FANG, Tao (Georgia Institute of Technology)

Co-authors: GHAVAMI, Ali (Georgia Tech); Dr GHIAASIAAN, Mostafa (Georgia Institute of Technology)

Presenter: FANG, Tao (Georgia Institute of Technology)

Session Classification: C1Or1C - Non-Aerospace Cryocooler Modelling and Studies