

Accepted Manuscript

Radiation Heat Transfer in High Porosity Open-cell Metal Foams for Cryogenic Applications

Tisha Dixit, Indranil Ghosh

PII: S1359-4311(16)30374-X

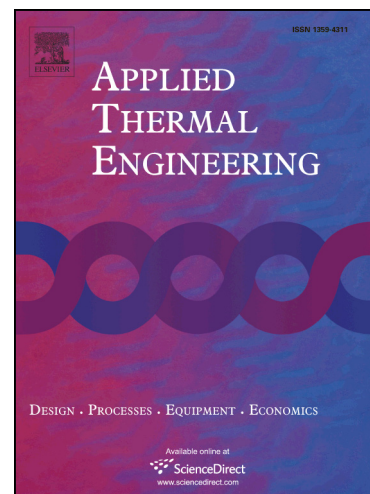
DOI: <http://dx.doi.org/10.1016/j.applthermaleng.2016.03.081>

Reference: ATE 7949

To appear in: *Applied Thermal Engineering*

Received Date: 15 September 2015

Accepted Date: 14 March 2016



Please cite this article as: T. Dixit, I. Ghosh, Radiation Heat Transfer in High Porosity Open-cell Metal Foams for Cryogenic Applications, *Applied Thermal Engineering* (2016), doi: <http://dx.doi.org/10.1016/j.applthermaleng.2016.03.081>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Radiation Heat Transfer in High Porosity Open-cell Metal Foams for Cryogenic Applications

Tisha Dixit

Cryogenic Engineering Centre, Indian Institute of Technology, Kharagpur – 721 302, India
(E-mail: tisha8889@iitkgp.ac.in)

Indranil Ghosh*

Cryogenic Engineering Centre, Indian Institute of Technology, Kharagpur – 721 302, India

*Corresponding Author (E-mail: indranil@hijli.iitkgp.ernet.in; Phone: 91-3222-283588; Fax: 91-3222-282258)

Abstract:

Radiation heat transfer in high porosity open-cell metal foams subjected to cryogenic temperatures has been studied. This study helps designing metal-foam-based devices exposed to radiation of deep space at extremely low temperature. Aluminium and copper foam samples with more than 90% and 95% void volume respectively and pore size in the range of 10–30 PPI have been studied. Suspending the foam samples freely inside a vacuum chamber (at 10^{-6} mbar) and maintaining the chamber wall at liquid nitrogen temperature, the cool down time-temperature profiles has been recorded for nearly 5.5 hours, wherein different foams reach temperatures in the range of 119-128K. Simultaneously, theoretical model based on lumped-capacity analysis has been developed to simulate the transient behaviour of foam samples. Simple cubic structure foam model has been used to estimate the view factor. The experimental outcome could be predicted by the theoretical model with reasonable accuracy. Additionally, cool-down history of an aluminium foam sample has been compared to a solid body of same weight so as to appreciate their radiative potential at low temperatures.

Keywords:

Radiation, Experimental transient study, Cryogenics, Aluminium foam, Copper foam

Download English Version:

<https://daneshyari.com/en/article/7048286>

Download Persian Version:

<https://daneshyari.com/article/7048286>

[Daneshyari.com](https://daneshyari.com)