

Università degli Studi di  
Napoli Federico II

Scuola Politecnica e  
delle Scienze di Base



Corso di Studi in  
Ingegneria Meccanica

Laurea Magistrale in Ingegneria Meccanica per l'Energia e l'Ambiente

(Classe delle Lauree Magistrali LM33)

Elaborato di Laurea

***Microtomography-based thermo-fluid dynamic analysis of metal foam :effects of ligaments shape on heat transfer***

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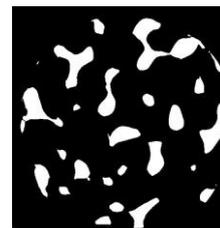
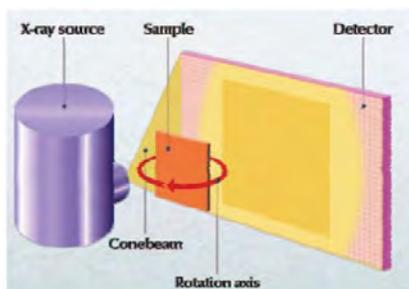
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**SOMMARIO**

Nowadays, metallic foams are widely used in many applications areas. In particular, properties such as light weight, open porosity, high surface area per unit volume and thermal resistance make them promising structures for heat exchangers (compact electronics cooling, cryogen tanks, PCM heat exchangers), CO<sub>2</sub> scrubbers, fuel cells, spacecraft (as the primary shield material), micrometeorite shields (protection of vital equipment against micrometeorite strikes in space), sound absorbers, optics, electrodes ,and energy absorbers (volumetric solar air receivers) Pressure drop and heat transfer of porous media have inspired a number of experimental and numerical studies and many models have been proposed in the literature. To study the convective heat transfer it is possible to use either an experimental approach or a numerical approach. In this study, a geometry closer to the real micro-structure of the metal foam is obtained by employing x-ray computed tomography (CT) . The heat transfer is investigated with the finite element software COMSOL® Multiphysics. Image analysis of the 3-D structure obtained by CT is applied to determine the total porosity, the surface to volume ratio and the size of a representative elementary volume for the thermal analysis. The aim of this work is to compare three different metal foam of equal pore density PPI and different porosity and ligaments shape, from the point of view of convective heat transfer, in order to stand out the influence of ligament shapes on convective heat transfer.



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