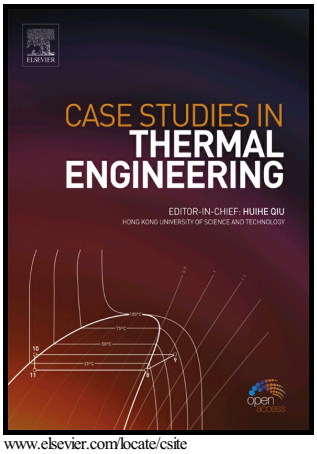

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David Calamas, Daniel Dannelley

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Average View Factors for Extended Surfaces with Fractal Perforations

David Calamas*
Assistant Professor
Department of Mechanical Engineering
Georgia Southern University
PO Box 8046
Statesboro, GA 30460-8046
Phone: (912) 478-5751
Fax: (912) 478-1455
Email: dcalamas@georgiasouthern.edu

Daniel Dannelley
Assistant Professor
Department of Mechanical Engineering
Embry-Riddle Aeronautical University
3700 Willow Creek Road
Prescott, AZ 86301-3720
Phone: (928) 777-6752
Email: DANNELLD@erau.edu

* Corresponding Author

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Extended surfaces are often used for passive thermal management of electronic devices. By perforating extended surfaces in accordance with the Sierpinski carpet fractal pattern, an increase in surface area and a decrease in mass can be achieved. Intersurface thermal radiation, within the perforations, can account for a significant percentage of the total radiative heat transfer rate. As the perforations are of a non-uniform size, a correlation for the average fin view factor as a function of fractal iteration and width-to-thickness ratio was developed. For example, while a fin inspired by the fourth iteration of the Sierpinski carpet fractal pattern has 23.30% more surface area than a solid rectangular fin of equal width-to-thickness ratio the same fin only exchanges 67.37% of the radiation emitted with the surroundings due to intersurface thermal radiation. Regardless of width-to-thickness ratio, there was found to be a finite number of fractal iterations after which the average view factor of the extended surface approached zero. Similarly, the percentage of the total surface area that the perforations