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Transport in Porous Fins From Laminar to Turbulent Regime FILIPPO COLETTI, Stanford University, KENSHIRO MURAMATSU, DENSO Corporation, BRIAN FURCINITI, CHRIS ELKINS, JOHN EATON, Stanford University — Lotus type porous metal has elongated pores of random size and spatial distribution but a common orientation. Sets of so-called lotus fins are obtained by slicing the metal into thin layers and stacking them in the flow path, forcing the fluid to pass through the pores. Lotus fins represent a promising alternative to metal foam heat exchangers, because they offer higher thermal conductivity and lower pressure drop. We have experimentally analyzed the fluid flow and heat transfer in lotus fins to determine their transport properties in a range of flow regimes. The investigated Reynolds numbers based on the pore diameter and inner velocity ranged from 100 to 4000. Three-dimensional mean velocity fields were obtained by magnetic resonance velocimetry performed on magnified replicas of the fins, allowing determination of the mechanical dispersion imposed by the random structure of the fins. Thermal measurements on non-conductive fins provided the global diffusivity coefficient, which accounts for molecular, mechanical and (at high Reynolds number) turbulent diffusion. The latter contribution was isolated and its relevance assessed as a function of the flow regime.

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