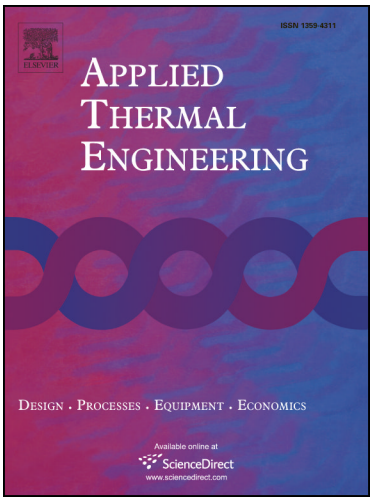

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Numerical Investigation on the Performances of Automotive Thermoelectric Generator Employing Metal Foam

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Abstract: The automotive thermoelectric generator(TEG) can recover the thermal energy of automotive exhaust and convert it into electric energy. The metal foam can provide a high heat transfer performance as well as sound absorption function, when it is applied in heat exchanger in TEG. The heat exchanger whose wall is attached with metal foam is modeled, and the temperature distribution and acoustic performance are calculated. The numerical simulations indicate that the TEG with metal foam has better sound reduction performance in high frequency noise and higher temperature distribution which can generate a high power while the power output of the TEG can reach 323.424W. Then three parameters of the metal foam, including porosity, thickness of the foam that attached to the eight surfaces and the octagonal foam attached to the outlet are calculated to invest their impacts. The results reveal that temperature distribution and output power gradual peak and decline as the porosity decreases, which will also lead to a deteriorative acoustic performance. The increase of metal foam thickness will contribute to enhance the thermal performance of the TEG, and better sound reduction can be obtained.

Keywords: TEG; metal foam; heat transfer; transmission loss