

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2018-69
Project Title:	Reducing fuel consumption and CO2 emission of automotive by harvesting waste heat from engine
Applicant:	Dr Chen Yue, Department of Mechanical Engineering, The University of Hong Kong
Total Approved Grant:	\$499,500
Duration:	15/5/2019 to 14/5/2022
Project Status/Remarks:	Completed
Project Scope:	The purpose of this project was to develop new bismuth telluride based alloys using state-of-the-art nanostructure fabrication methods for enhanced thermal energy conversion efficiency and promote their applications in automotive engines for harvesting waste heat. The successful implementation of the proposed project would result in reductions of fuel consumption and CO2 emission of vehicles.
Summary of the Findings/Outcomes:	A large amount of fuel energy consumed in vehicles and various industries is simply wasted in the form of heat, which usually escapes into air. Low energy efficiency resulted in the increase of the emission of greenhouse gases and the waste of non-renewable resources of fossil fuels. Thermoelectric materials could directly convert heat into electricity, and they were promising for recycling waste thermal energy. Bismuth tellurides and selenides, which were mainly used in the cooling industries, were the most studied thermoelectric materials; however, their energy conversion efficiencies were yet to be further enhanced. In this project, using recently developed materials fabrication techniques, the project team had synthesized new bismuth telluride and selenide alloys. The experimental measurements indicated that these new alloys had enhanced thermal energy conversion efficiencies. The improved performance of these materials was achieved based on optimal carrier concentrations and a fine balance between the thermal and electrical transport properties. The results obtained in this project facilitated potential wider applications of bismuth telluride and selenide based thermoelectric materials.