Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2018-66
Project Title:	Ultralong, suspended perovskite nanowires for thermoelectric devices
Principal Investigator:	Dr Kim Ji Tae, Department of Mechanical Engineering, The University of Hong Kong
Total Approved Grant:	$494,000
Duration:	1/6/2019 to 31/5/2021
Project Status/Remarks:	Completed
Project Scope:	The project is to develop an on-demand direct writing method for ultralong perovskite nanowires suspended in air. The key idea is to exploit a nano-sized liquid meniscus to continually guide crystallisation in ambient air, resulting in high aspect ratio freestanding nanostructures. The preliminary result gives an insight into how millimetre-long nanowires can be fabricated at will. This project aims to – (a). develop the fabrication protocol for nanowires with programmed diameters and lengths; and (b). characterise their thermoelectric properties at single-nanowire level by direct integration to thermoelectric modules. It is expected that the proposed project would provide a simple, low cost, but precise fabrication/integration methodology for green renewable energy micro / nano devices.
Summary of the Findings/Outcomes:	In this project, the project team proposed the fabrication of ultralong perovskite nanowires for thermoelectric applications. The team developed nanoscale 3D printing method for metal halide perovskites, which is previously-unseen. The developed method offers an on-demand, minimalist route to produce various electronic, photonic perovskite-based devices without design restriction. The printed perovskite's thermoelectric properties were characterized by using a home-built measurement platform. As a result, the Seeback coefficients of various perovskites have successfully been measured. The team's work is expected to facilitate the manufacturing of perovskite thermoelectric devices with diverse chemical compositions and geometries, optimizing for customized use.