Integration of 2-Dimensional Materials for Thermoelectric Power Generation

FADHEL ALSAFFAR, ABDULRAHMAN AL HUSSAIN, MOH. R. AMER, None, CENTER OF EXCELLENCE FOR GREEN NANOTECHNOLOGIES COLLABORATION, DEPARTMENT OF ELECTRICAL ENGINEERING (UCLA) COLLABORATION — Recent developments in nanomaterial research have significantly progressed the performance of thermoelectric devices. Theoretical investigations of the thermoelectric properties of 2-Dimensional monolayers demonstrate a high figure of merit (ZT) \[1, 2\]. Here, we investigate the integration of these 2-Dimensional materials for power generation applications using solar heat. We show that using black phosphorus monolayer (phosphorene) as the \(p\)-type material, and Molybdenum disulfide (MoS\(_2\)) monolayers as the \(n\)-type material, we get an effective figure of merit (ZT) at least (1.5) with a conversion efficiency of 13\% at 280\(^\circ\)C. Our results suggest that the integration of various 2-Dimensional materials is a promising approach for commercial thermoelectric power generation applications.