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Experimental Platform for Studying Thermoelectric Properties in Vacuum Gaps and Molecular Junctions WONHO JEONG, YOUNGSANG KIM, KYEONGTAE KIM, WOOCHUL LEE, PRAMOD REDDY, Univ of Michigan - Ann Arbor — Electromigrated break junction (EBJ) based molecular devices have enabled many research groups to study nanoscale charge transport. Although EBJ devices have been extensively used due to the advantages of a three terminal configuration in tuning the electronic structure, it has not been possible to use them to study thermoelectric properties. This is because creating temperature differentials across the nanogap of EBJs is technically challenging. In order to overcome this experimental limitation, we carefully designed and created a new experimental platform (EBJIH, EBJ with integrated heater) that enables us to study thermoelectric properties in vacuum gaps and molecular junctions. To prove that temperature differentials can be established in these three terminal devices, we performed nanometer resolution thermal imaging using scanning thermal microscopy under UHV conditions. The results clearly show that temperature differentials can indeed be established in the devices. Further, we have used these devices to study the thermoelectric properties of vacuum gaps between gold electrodes and found that the thermoelectric properties were very sensitive to gap dimensions. We are also currently adopting this platform to study thermoelectric properties in molecular junctions.

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