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High resolution thermal properties study of Joule self-heated graphene nanoribbon[1] YOUNG-JUN YU, MELINDA Y. HAN, STÉPHANE BERCIAUD, TONY F. HEINZ, LOUIS E. BRUS, Columbia University, KWANG S. KIM, Pohang University of Science and Technology, PHILIP KIM, Columbia University — We present high resolution thermal properties of Joule self-heated graphene nanoribbons (GNRs) by scanning thermal microscope (SThM) which enables local temperature survey within 100 nm spatial resolution. In order to calibrate the SThM probes, we employ the micro-Raman spectroscopy to measure the temperature distribution across a standard graphene device as a function of applied electrical power. This calibrated SThM measurement allows us to scrutinize the temperature distributions in GNRs attributed to Joule heating variation in the channel due to the locally enhanced scattering which forms hot spot formation. We also estimate the junction thermal resistance between GNR and SiO_2 substrate from the temperature distribution of the GNR devices. In addition, we will discuss simultaneous SThM and scanning Kelvin probe microscopy study of high quality exfoliated graphene on hexagonal boron nitride substrate.

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