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Fabrication and In-situ TEM Characterization of Freestanding Graphene Nanoribbons Devices QING WANG, RYO KITaura, SHOJI SUZUKI, HIsANORI SHINOHARA, Department of Chemistry, Nagoya University, SHINOHARA TEAM — Edge-dependent electronic properties of graphene nanoribbons (GNRs) have attracted intensive interests. To fully understand the electronic properties of GNRs, the combination of precise structural characterization and electronic property measurement is essential. For this purpose, a new experimental technique using freestanding GNR devices has been developed, leading to the simultaneous characterization of electronic properties and edge structure of GNRs. To prepare freestanding GNR devices, graphene was first transferred on a Si substrate with an open slit covered by a silicon dioxide layer, and then silicon dioxide membrane underneath the graphene was etched away by buffered hydrogen fluoride acid. The so-prepared freestanding graphene device was assembled to a home-made TEM holder for in-situ characterization. The freestanding graphene was sculpted by a focused electron beam in TEM, purified and narrowed by Joule heating down to several nanometers width. Structure-dependent electronic properties were performed in TEM. We have observed significant increase in resistance and semiconductive behavior became more dominant with decreasing width of GNR.

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