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Selective formation of zigzag-edges in graphene cracks MIHO FUJIHARA, Nagoya University, RYOSUKE INOUE, YUTAKA MANIWA, Tokyo Metropolitan University, HISANORI SHINOHARA, Nagoya University, YASUMITSU MIYATA, Tokyo Metropolitan University — Graphene edges have attracted much attention due to their unique electrical and magnetic properties. To understand these properties, it is highly desired to prepare clean, smooth, and structure-controlled edges. However, structure selective preparation of zigzag or armchair edges has not been achieved yet. Here, we report the selective formation of graphene edges aligned in the zigzag orientation by cleavage with thermally-assisted tensile stress. Graphene grains were grown from methane on copper foil by using chemical vapor deposition. After cooling to room temperature, we occasionally observed zigzag-shaped cracks in graphene. Considering the grain edges which have the zigzag face, these cracks are found to propagate parallel to the zigzag edges. The origin of tension is probably due to the non-uniform lattice strain of graphene induced by thermal shrinking of Cu substrates as supported by Raman strain mapping. Furthermore, we demonstrate the carrier tuning around graphene edges by applying the electric field to the cracks. Our findings pave the way for the fabrication and applications of smooth, long zigzag edges of graphene and other two dimensional materials.

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