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Stability of graphene nanoribbon edges under high temperature joule heating XIAOTING JIA, MARIO HOFMANN, MIT, VINCENT MEUNIER, BOBBY SUMPTER, ORNL, JESSICA CAMPOS-DELGADO, JOSE ROMO-HERRERA, IPICYT, Mexico, JING KONG, MIT, MAURICIO TERRONES, IPICYT, Mexico, MILDRED DRESSELHAUS, MIT — Graphene nanoribbon edges have generated a lot of research interests recently, due to the different electronic properties of the ribbons arising from zigzag and armchair edges. Recent progress has shown that atomically smooth graphene nanoribbon edges can be produced using joule heating. In order to fully understand the joule heating process and study the stability of graphene nanoribbon edges, we investigated the temperature that is reached during the joule heating process using metal particles. Metal particles on a suspended ribbon melt and evaporate with enough resistive joule heating, thereby providing a temperature calibrator of the ribbon surface. The successive melting process also provides a temperature gradient along the ribbon length. Thermodynamic calculations are carried out to estimate the melting point of the nanoparticles as a function of decreasing size. We also investigated the different edge junctions that were formed after the joule heating process. Our results showed that certain types of zigzag-armchair edge junctions are more dominant. Another type of zigzag-armchair edge junction, which is unstable, was found to reconstruct to form a stable edge junction during joule heating.

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