Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Anisotropic etching effect in graphene for its nanostructure engineering and defect detection RONG YANG, ZHIWEN SHI, SHUANG WU, DONGXIA SHI, GUANGYU ZHANG, Institute of Physics, Chinese Academy of Sciences — We report a highly anisotropic dry etching technique for graphene. The etching depends strongly on its crystal orientation, resulting in zigzag-edge formation. The etching rates can be precisely controlled to several nm/min by plasma intensity and temperature. The etching only starts at defect sites and the quality of graphene can be preserved. This simple technique is compatible with existing semiconductor processing technology, thus it is useful for large-scale graphene tailoring and defect detection. We have fabricated graphene nanoribbons (GNRs) along designed crystallographic directions, which have shown high nobilities and smooth zigzag edges with localized metallic edge state. Besides, we have directly identified the structural defects in graphitic materials (for example HOPG, Kish graphite, CVD graphene, SiC epitaxial graphene, etc) through defect etching magnifying technique. Rich information on their structural disorders including the defects types, defect densities, lattice orientations, stacking disorders, grain sizes and grain boundaries were extracted.

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Date submitted: 07 Nov 2012 Electronic form version 1.4