Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Thermal transport in graphene junctions and quantum dots
YONG XU, XIAOBIN CHEN, BING-LIN GU, WENHUI DUAN, Center for Advanced Study and Department of Physics, Tsinghua University, Beijing, China, JIAN-SHENG WANG, Department of Physics and Centre for Computational Science and Engineering, National University of Singapore, Singapore — Thermal design for individual nanodevice is indispensable to nanoelectronics due to the more and more serious heat dissipation. As a significant support to the development of graphene-based nanoelectronics, we systematically investigate thermal transport in various graphene junctions and quantum dots by nonequilibrium Green's function method. We find that thermal transport shows quite different characteristics with respect to electronic transport. Thermal conductance of graphene junctions is insensitive to the detailed structure of the contact region and the width of wide part, while decreasing the width of narrow part will dramatically reduce thermal conductance. Moreover, graphene junctions with small connection angle and zigzag edge have better thermal transport properties. Thermal conductance of graphene quantum dots is extremely low in most cases due to the existence of the narrow constrictions. Our research provides guidance to thermal design for nanodevices and could eventually find applications in nanoelectronics and thermoelectricity.

Yong Xu
Center for Advanced Study and Department of Physics,
Tsinghua University, Beijing, China

Date submitted: 01 Dec 2009 Electronic form version 1.4