

Unusual RG flow and possible temperature-dependent transition in strongly disordered monolayer graphene grown on SiC

Chi-Te Liang

梁啟德

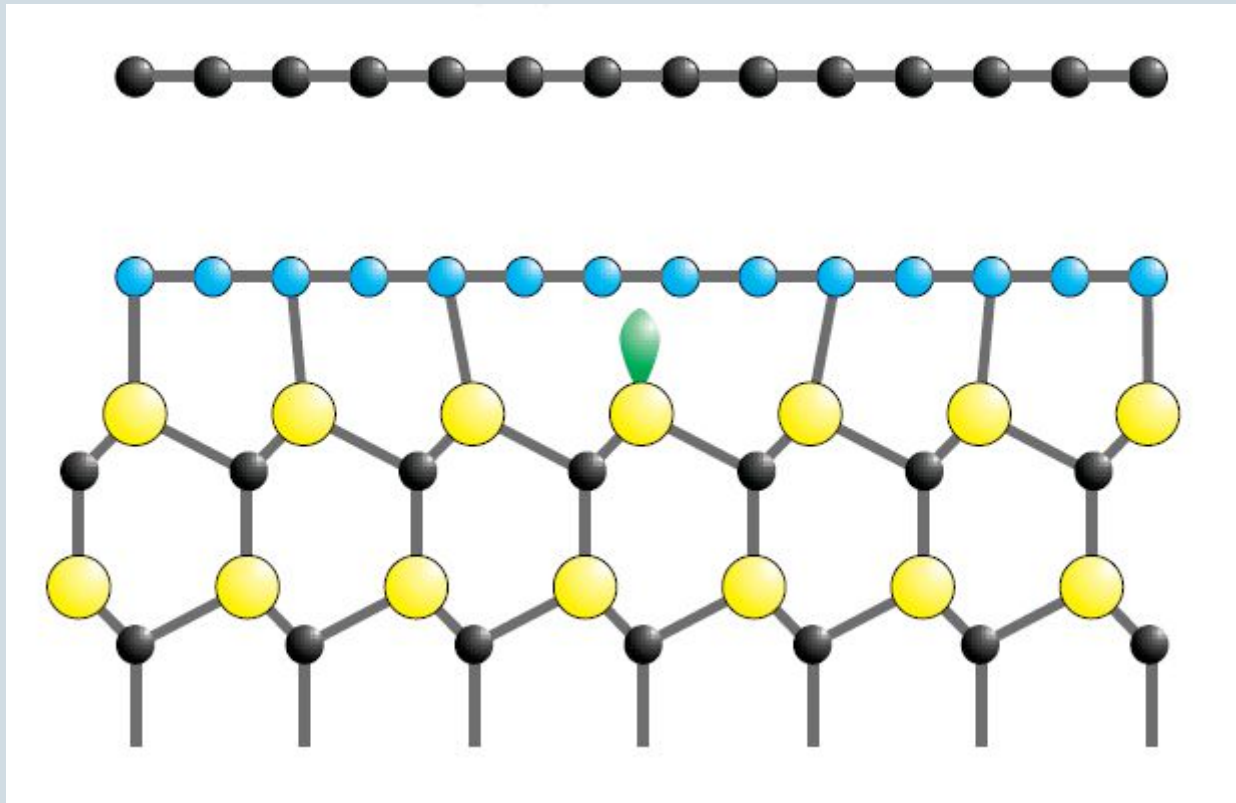
*Department of Physics, National Taiwan University,
Taipei 106, Taiwan*

*Graduate Institute of Applied Physics, National Taiwan
University, Taipei 106, Taiwan*

*Department of Physics, Stanford University,
Stanford, CA 94305, USA*

Epitaxial graphene on SiC

Claire Berger *et al.*, *J. Phys. Chem. B* 108, 19912 (2004).



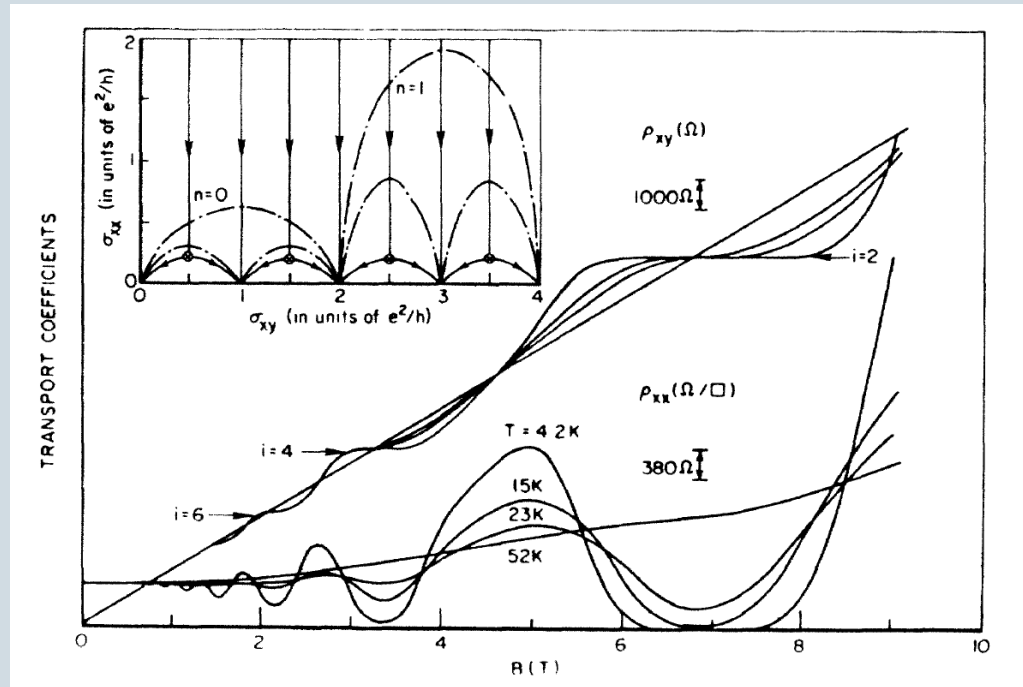
Monolayer graphene

Buffer layer

After F. Fromm *et al.*, *New J. Phys.* 15, 043031 (2013).

Semi-circle and T -driven flow lines

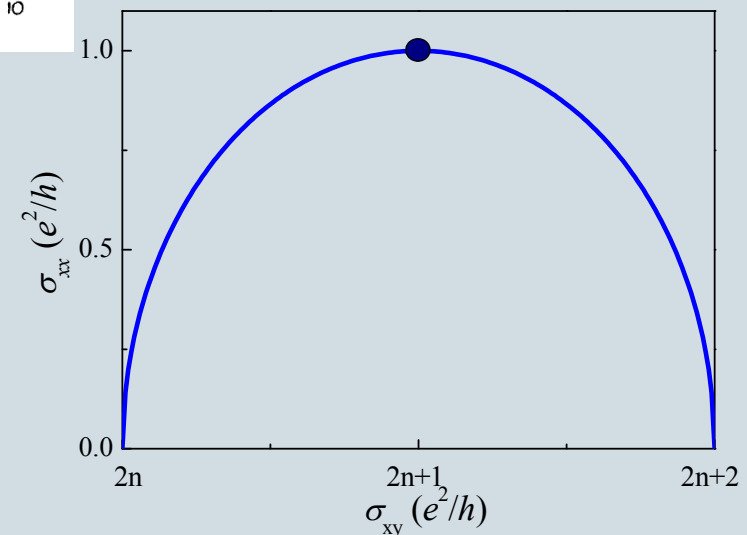
H. P. Wei, D. C. Tsui and A. M. M. Pruisken, *Phys. Rev. B* 33, 1486 (1985)



Renormalization Group (RG) flow

$$\sigma_{xx} = \rho_{xx} / [(\rho_{xx})^2 + (\rho_{xy})^2]$$

$$\sigma_{xy} = \rho_{xy} / [(\rho_{xx})^2 + (\rho_{xy})^2]$$

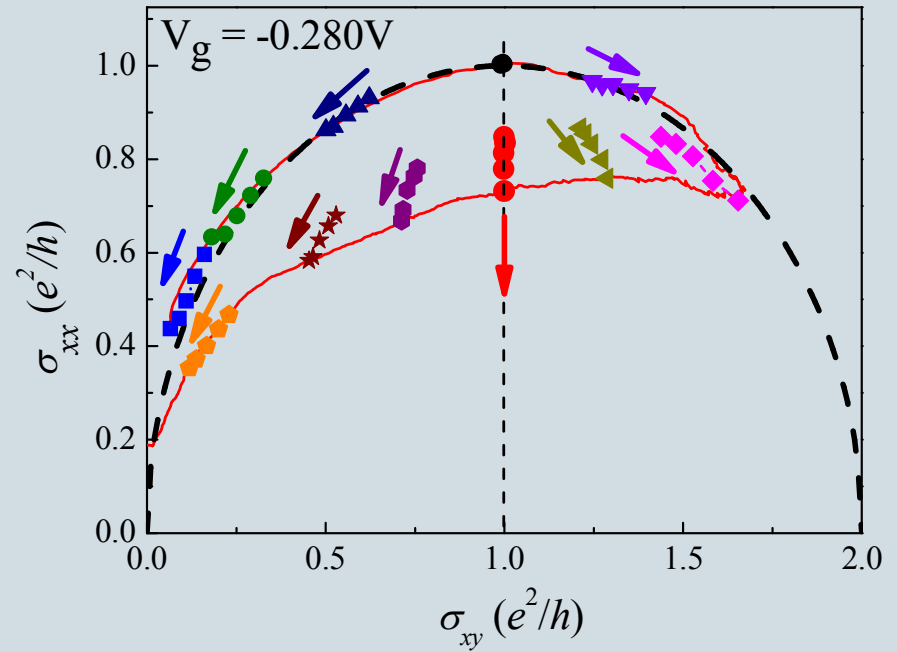
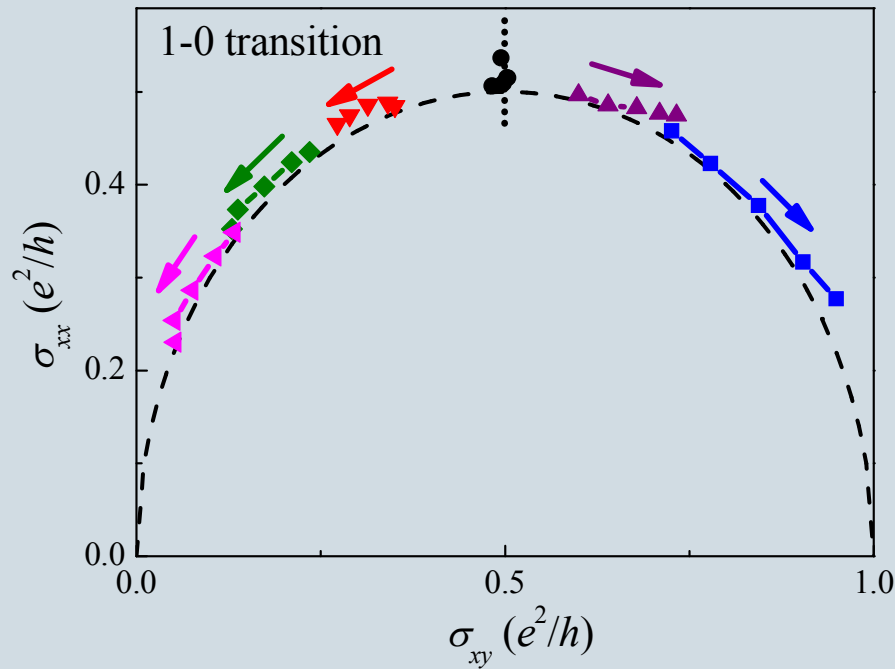


Y.-T. Wang *et al.*, *JPCM* 24, 405801 (2012)

An experimental study on $\Gamma(2)$ modular symmetry in the quantum Hall system with a small spin splitting

C F Huang^{1,2}, Y H Chang^{1,7}, H H Cheng³, Z P Yang³, H D Yeh^{1,2},
C H Hsu¹, C-T Liang¹, D R Hang^{4,5} and H H Lin⁶

Cliff Burgess and Brian Dolan,
Phys. Rev. B **76**, 113406 (2007)



Interested in the insulating regime where σ_{xx} approaches zero.

Y.-T. Wang *et al.*, JPCM **24**, 405801 (2012)



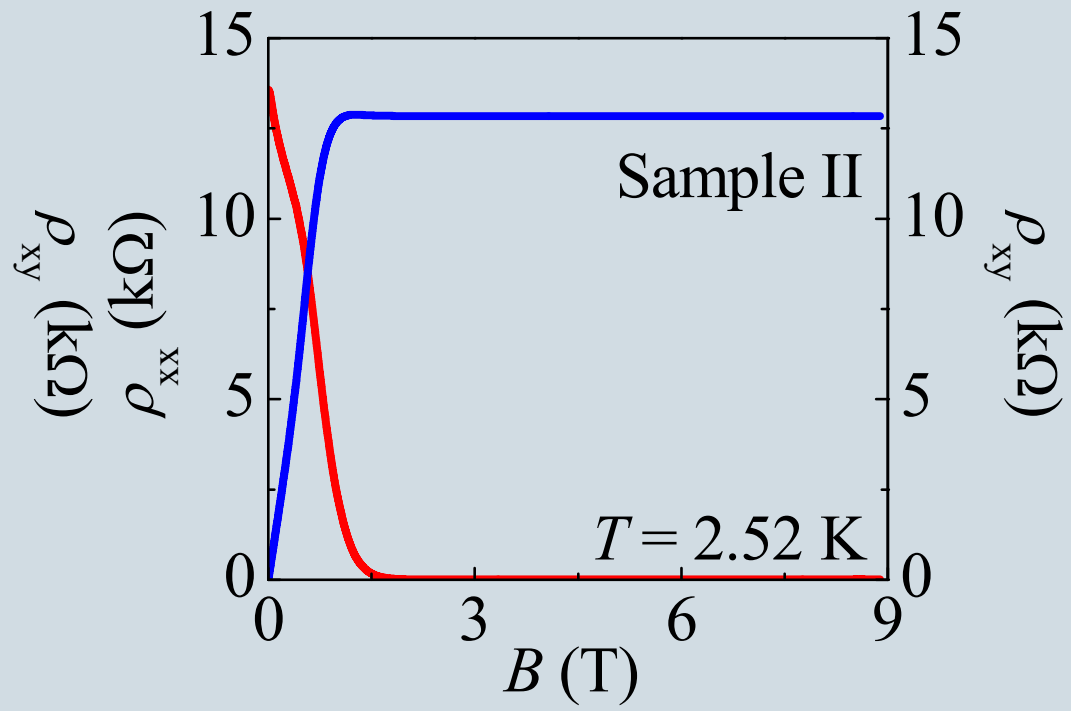
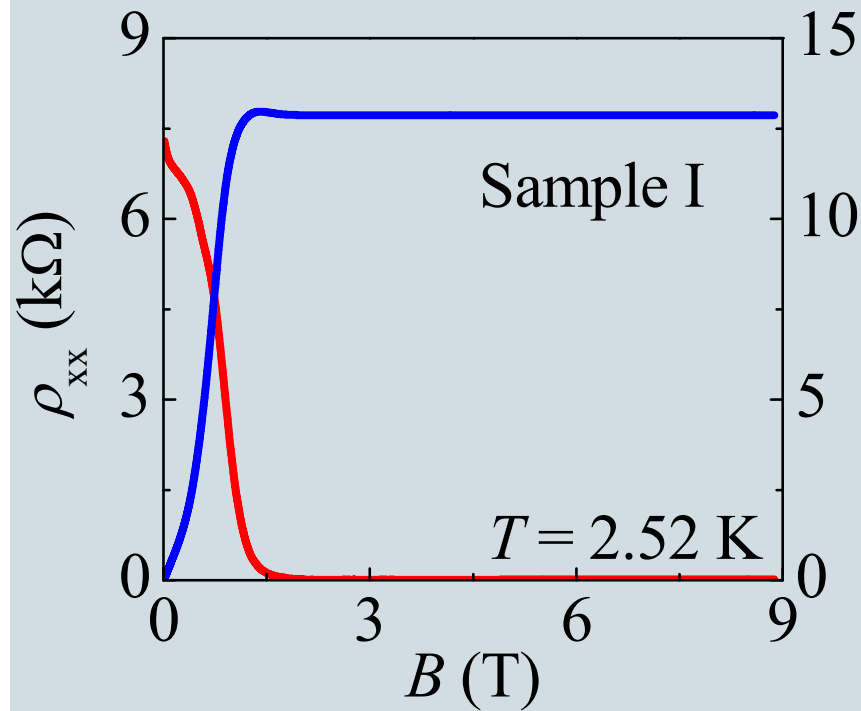
communications

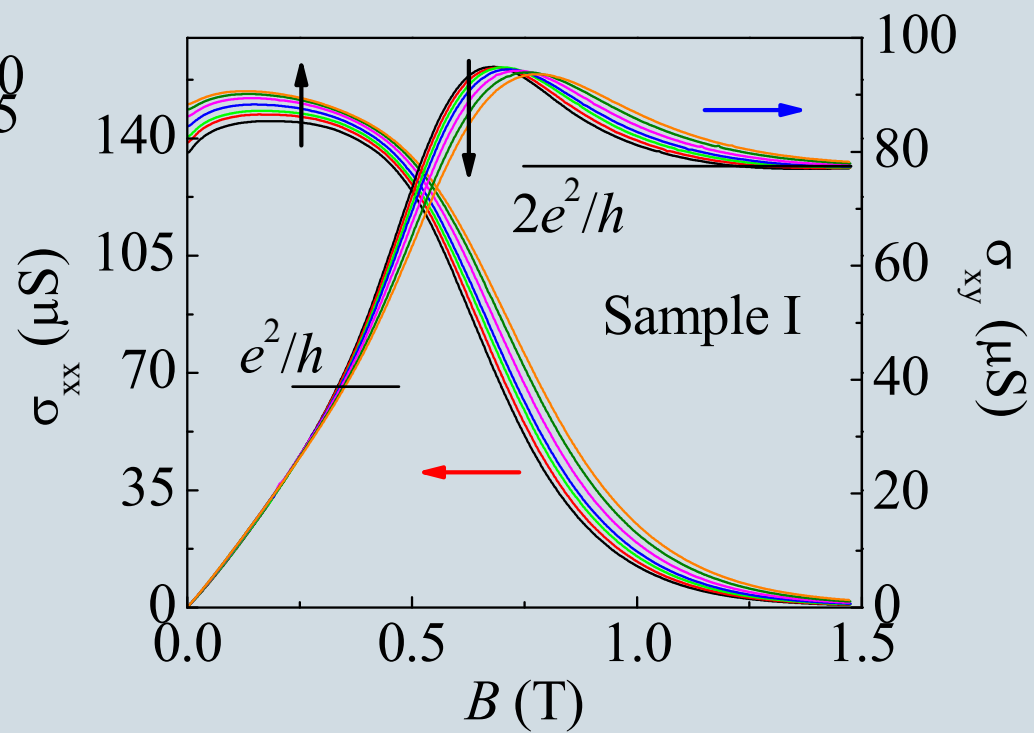
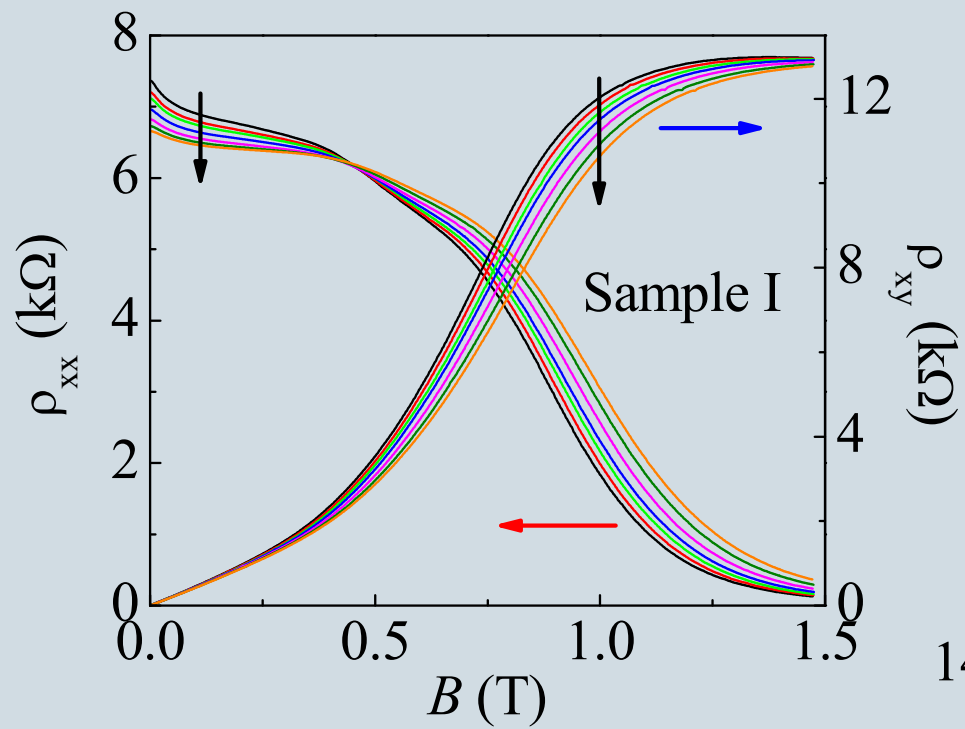
Materials
Views
www.MaterialsViews.com
Graphene

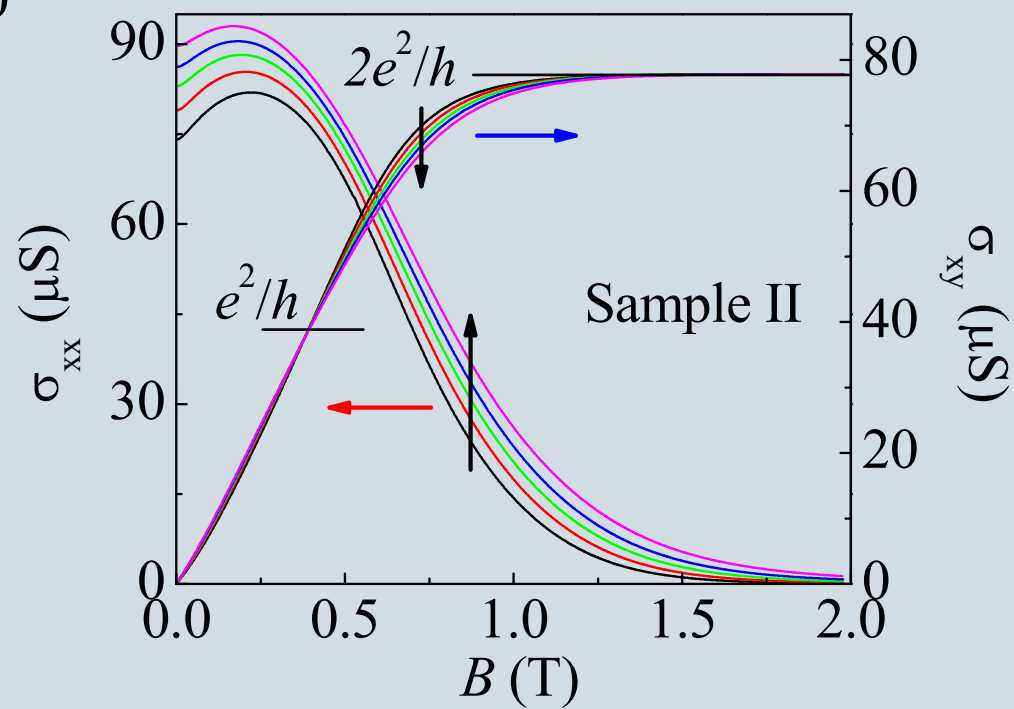
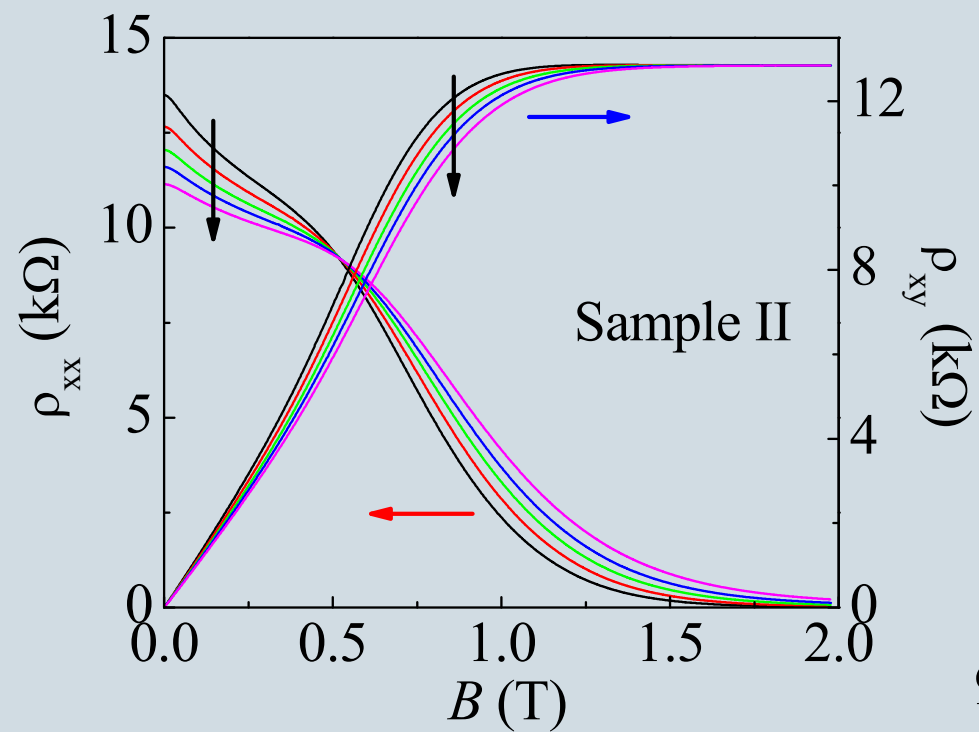
Low Carrier Density Epitaxial Graphene Devices On SiC

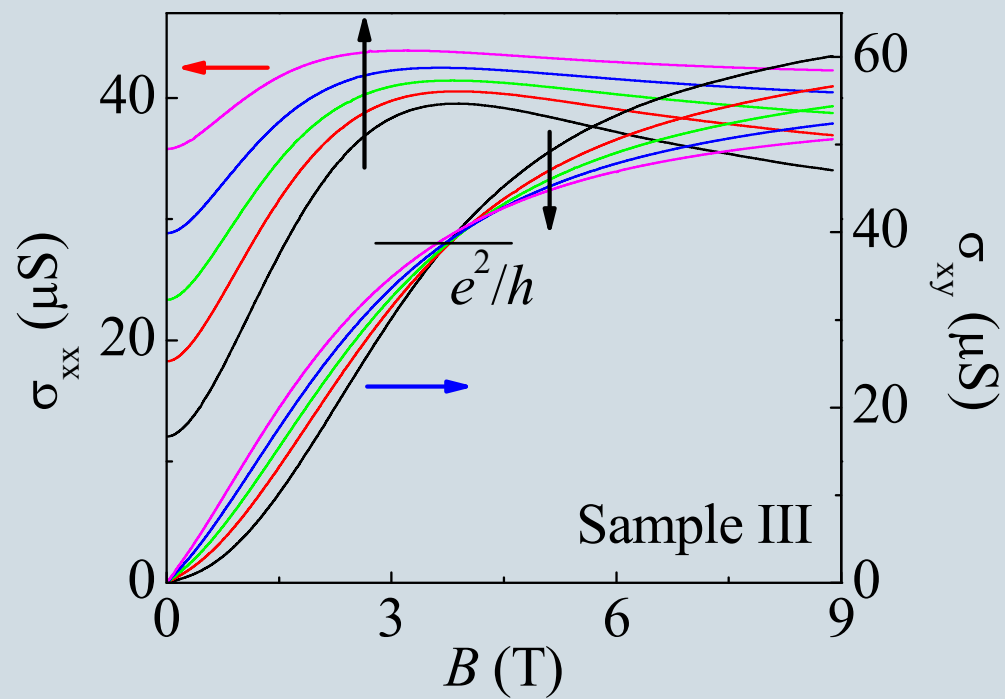
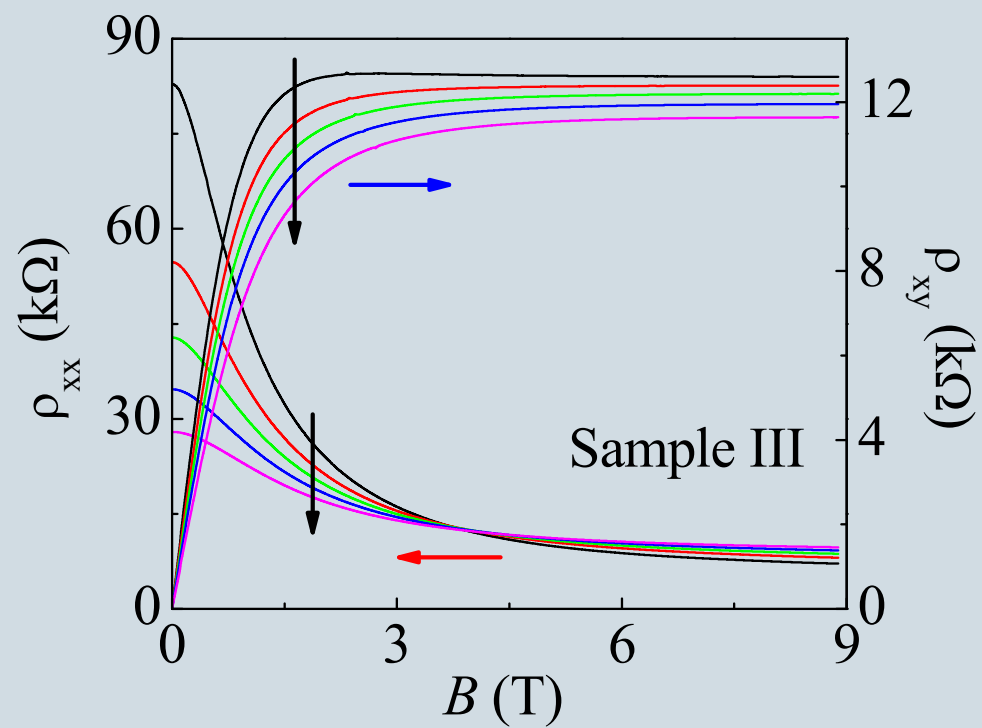
Yanfei Yang,* Lung-I. Huang, Yasuhiro Fukuyama, Fan-Hung Liu, Mariano A. Real, Paola Barbara, Chi-Te Liang, David B. Newell, and Randolph E. Elmquist

Small 11, 90 (2015)

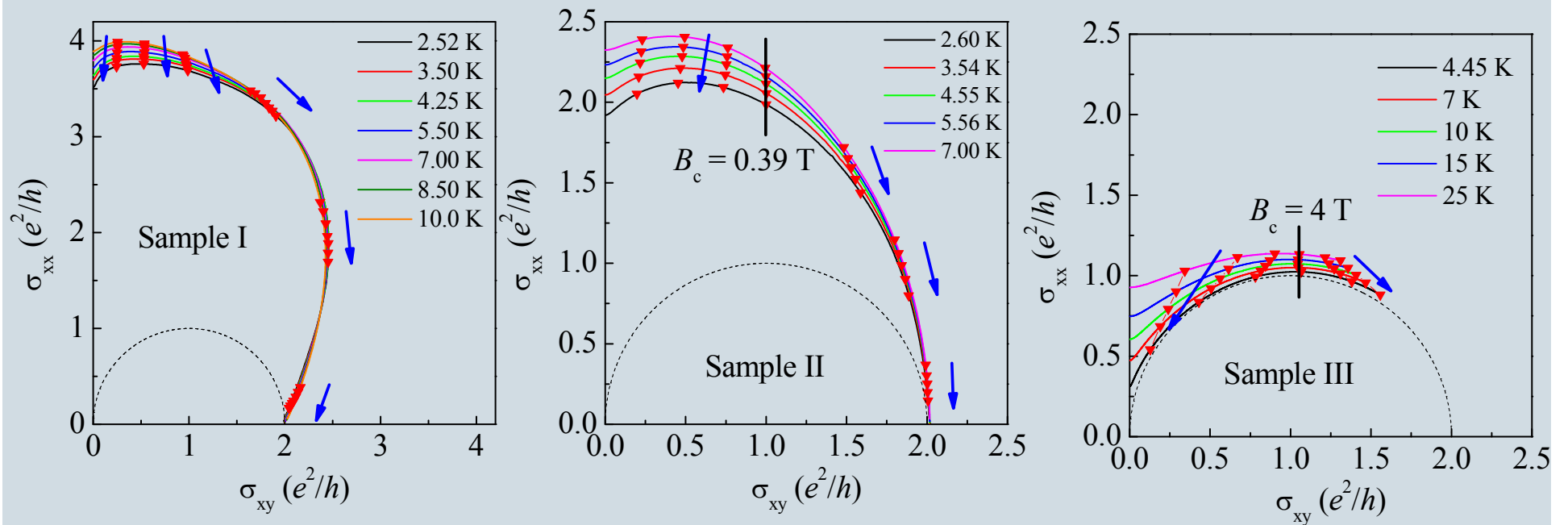






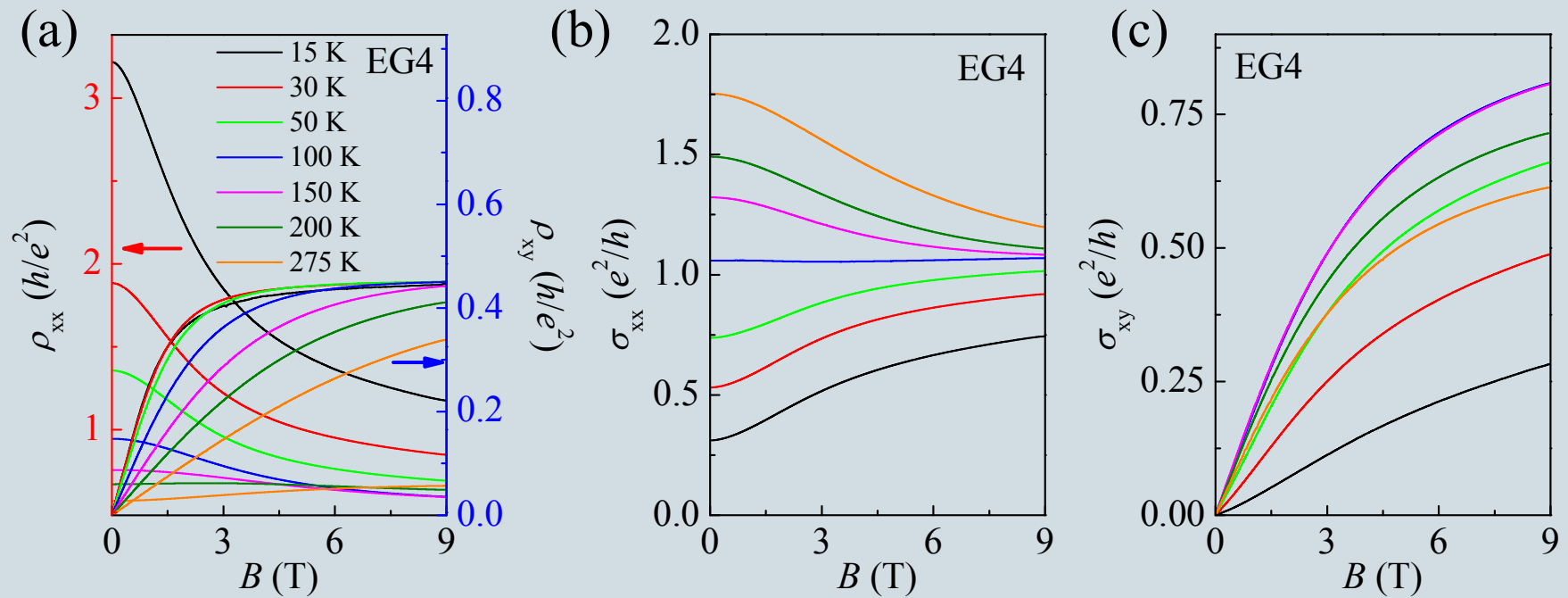


Crossing point in σ_{xy} : quantum phase transition at $T=0$ driven by magnetic field

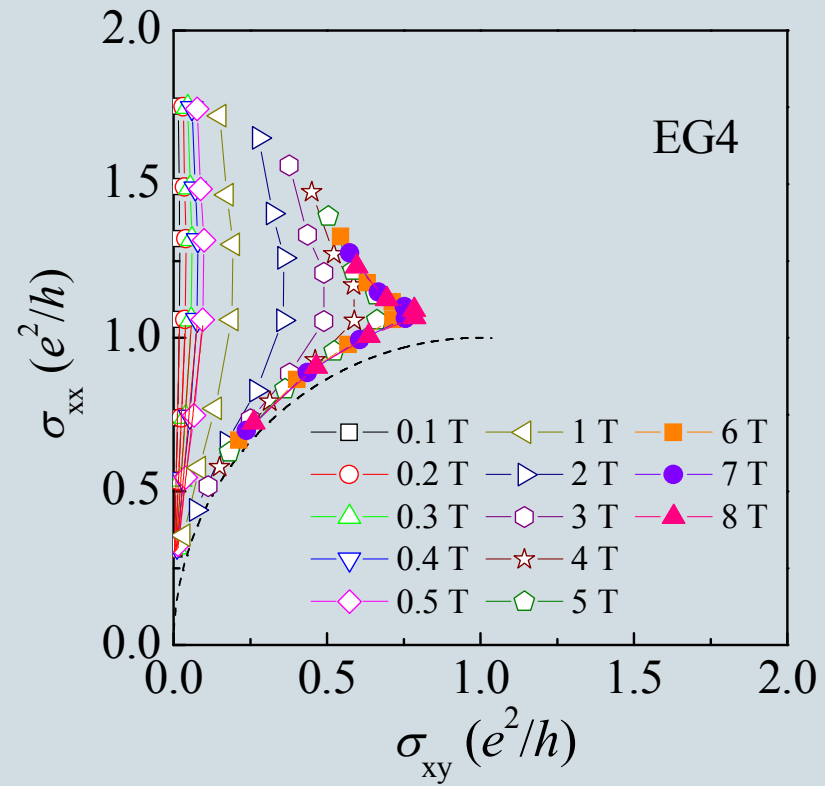
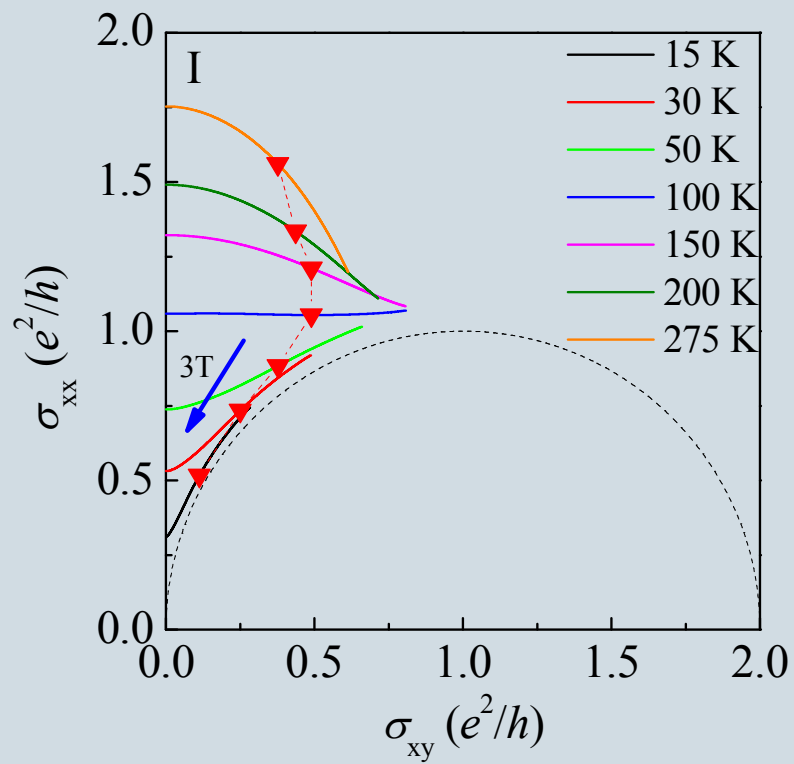


L.-I. Huang *et al.*, *RSC Adv.* 6, 71977 (2016).

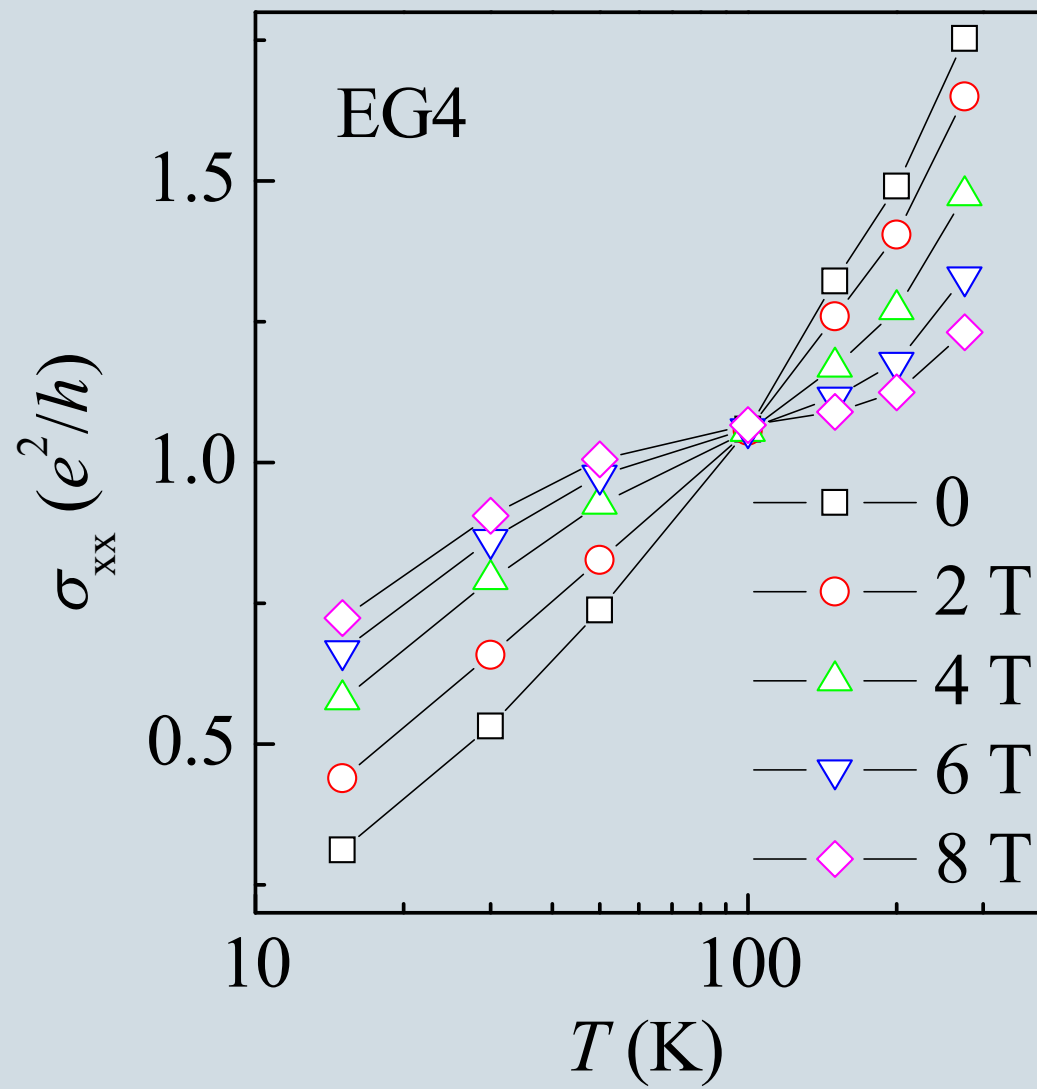
Strongly disordered monolayer graphene grown on SiC

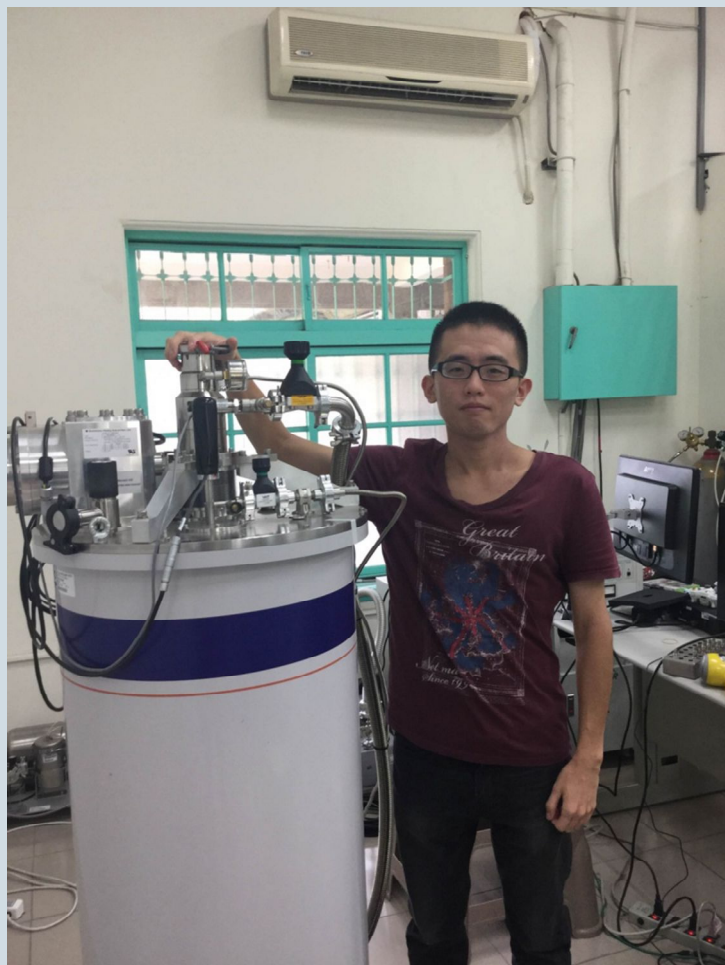


L.-I. Huang *et al.*, *RSC Adv.* 7, 31333 (2017).



Cusp-like RG flow





Dr. Shun-Tsung Lo (羅舜聰)

Department of Physics, National
Cheng Kung University, Tainan,
Taiwan

Disordered two-dimensional (2D)
materials, disordered 2D materials
and superconductivity

[Create Citation Report](#)

[Analyze Results](#)

- 1. **Nitrogen-Doped Graphene Sheets Grown by Chemical Vapor Deposition: Synthesis and Influence of Nitrogen Impurities on Carrier Transport**

By: Lu, Yu-Fen; Lo, Shun-Tsung; Lin, Jheng-Cyuan; et al.
ACS NANO Volume: 7 Issue: 8 Pages: 6522-6532
Published: AUG 2013

[Find It@NTU](#)

[View Abstract](#)

Times Cited: 115

*(from Web of Science Core
Collection)*

Highly Cited Paper

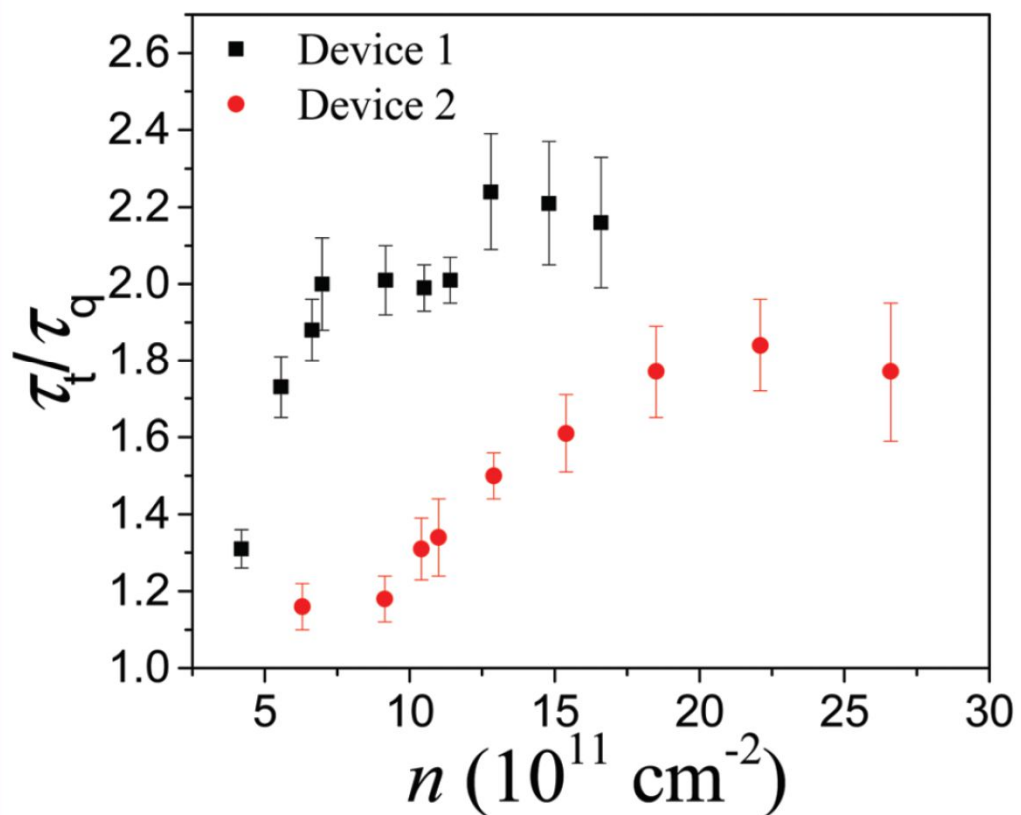
Usage Count



Cite this: *Nanoscale*, 2017, 9, 11537

Chemical-doping-driven crossover from graphene to “ordinary metal” in epitaxial graphene grown on SiC†

Chiashain Chuang,^{a,b,c} Yanfei Yang,^{a,d} Sujitra Pookpanratana,^{id}^a
Christina A. Hacker,^{id}^a Chi-Te Liang,^{id}^{*b,e} and Randolph E. Elmquist,^{id}^{*a}



Summary

- Observation of cusp-like RG flow
- Temperature-dependent transition?
- Monolayer epitaxial graphene is a good disordered system for probing interesting physics
- More theoretical and experimental work needed