Supporting Information

Intercalation of Few-Layer Graphite Flakes with $FeCl_3$: Raman Determination of Fermi Level, Layer by Layer Decoupling and Stability

Weijie Zhao,[†] Ping Heng Tan,*[,†] Jian Liu,[†] Andrea C. Ferrari[‡]

[†]State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences, Beijing 100083, China

[‡]Department of Engineering, University of Cambridge, Cambridge CB3 0FA, United Kingdom

* Email address: phtan@semi.ac.cn

Supporting Information

1. Multiple G peaks resulting from non-uniform doping in graphite by $FeCl_3$

Fig. S1 plots the Raman spectrum of $FeCl_3$-doped graphite with a low doping level. Multiple G peaks can be seen, resulting from non-uniform doping. The highest peak is at ~ 1625 cm^{-1}, close to stage-1 GICs, while the lowest ~1585cm^{-1} corresponds to almost pristine graphite.

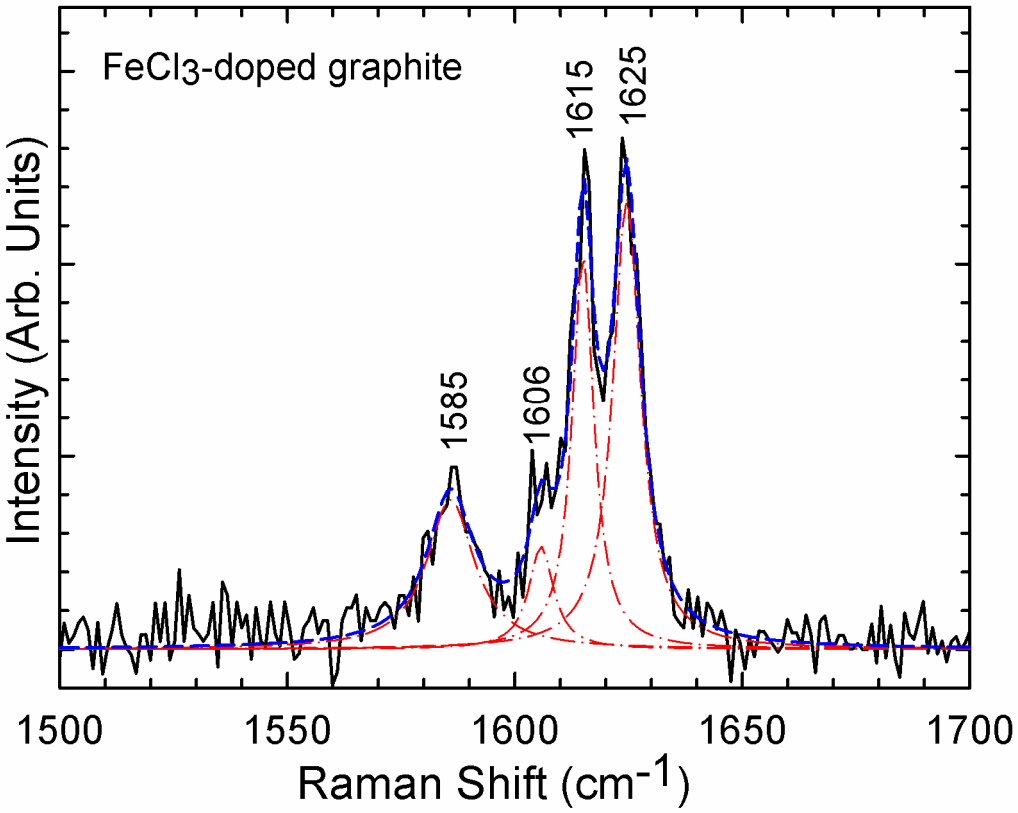

Figure S1: multiple G peaks in $FeCl_3$-doped graphite with a low doping level.

2. Doping uniformity in 1-4L flakes

Fig. S2 shows the Raman spectra of $FeCl_3$-doped/intercalated 1-4L flakes probed in different positions. The doping of 2-4L flakes is quite homogenous, while for SLG,

the G band has a spatial dependence, which indicates inhomogeneous doping.

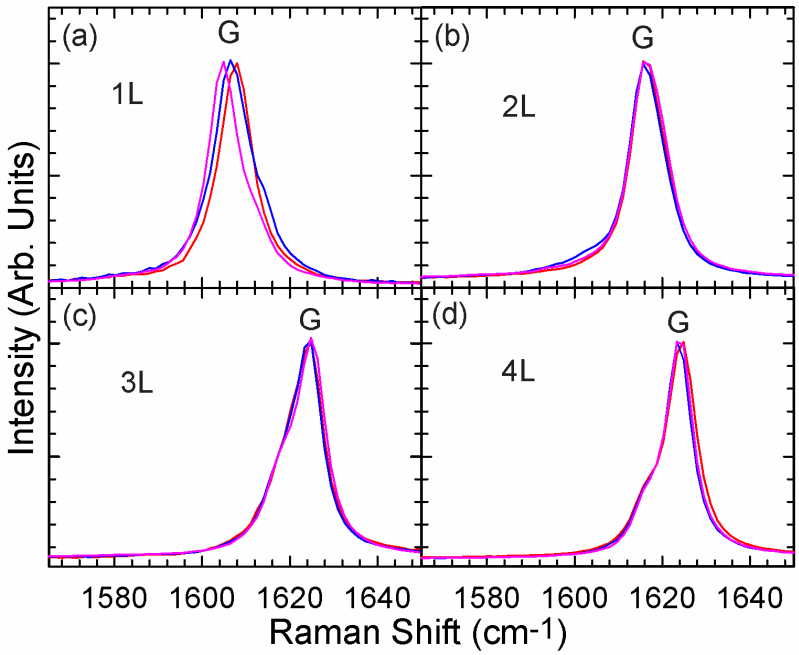

Figure S2: The G band of $FeCl_3$-doped/intercalated 1-4L flakes at different positions

3. Estimation of $FeCl_3$ dielectric constant

The dielectric constant ε is estimated from the experimental data for $FeCl_3$ in aqueous solutions [Ref. S1]. Fig. S3 shows the dielectric constant (blue triangles) of $FeCl_3$ aqueous solutions at different concentrations deduced from the corresponding refractive index [Ref. S1]. ε changes almost linearly as a function of $FeCl_3$ concentration. We extrapolate the data points at 0% (pure water) and 100% (pure $FeCl_3$) as 1.78 and 1.86, respectively. For ε=1.86, Fig. 3 of Ref. S2 gives $f(e^2/2\varepsilon_0\varepsilon h\upsilon_F)$~0.09. If the refractive index of $FeCl_3$ fluctuates 20%, then ε fluctuates 40%, and $|E_F|$ fluctuates~13 %. Therefore, $|E_F|$ is not very sensitive to the ε variation.

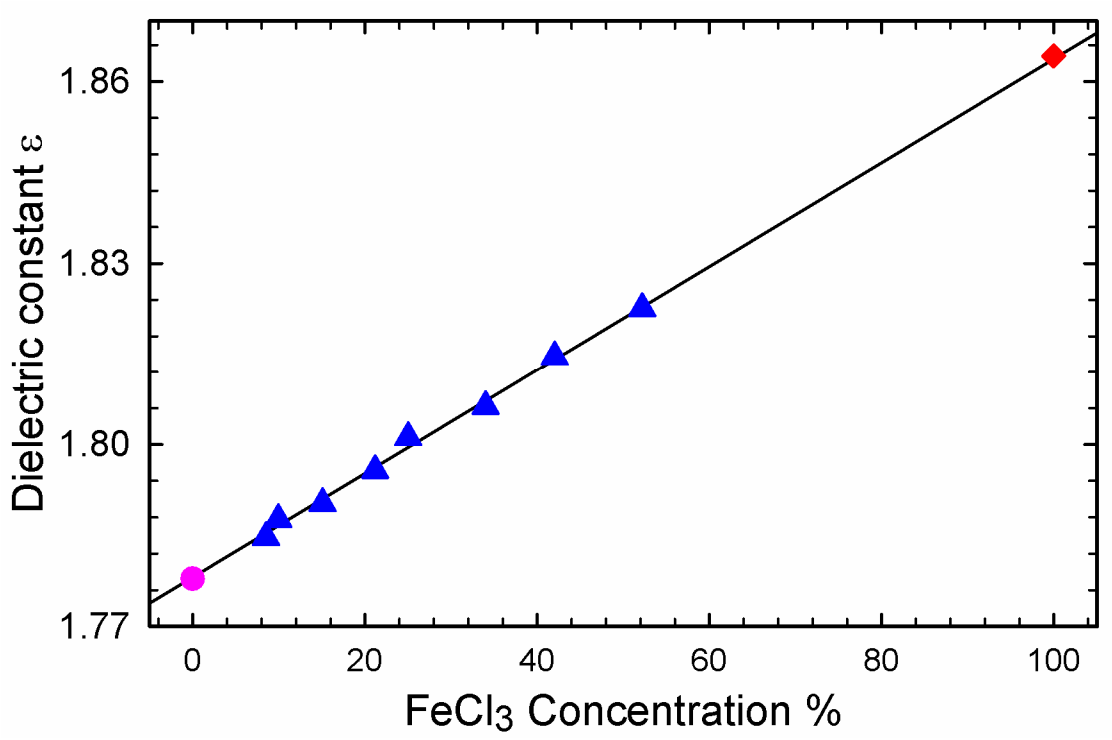

Figure S3. Dielectric constant (blue triangles) of $FeCl_3$ aqueous solutions as a function of the $FeCl_3$ concentration deduced from the corresponding refractive index [Ref. S1]. The circles are the extrapolated points for pure water (pink) and pure $FeCl_3$ (red).

References

S1. El-Shistawi, N. A.; Hamada, M. A.; Gomaa, E. A. Chemistry 2009, 18, 5. Opto Mechanical Properties of $FeCl_3$ in Absence and Presence of PVA (Polyvinyl Alcohol) and 50% (V/V) Ethanol-Water Mixtures

S2. Basko, D. M.; Piscanec, S.; Ferrari, A. C. Phys. Rev. B 2009, 80, 165413.