Supporting Information

Intercalation of Few-Layer Graphite Flakes with FeCl₃: Raman Determination of Fermi Level, Layer by Layer Decoupling and Stability

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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 ~1585 cm$^{-1}$ corresponds to almost pristine graphite.

![Figure S1: multiple G peaks in FeCl$_3$-doped graphite with a low doping level.](image)

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 FeCl₃-doped/intercalated 1-4L flakes at different positions](image)

3. **Estimation of FeCl₃ dielectric constant**

The dielectric constant $\varepsilon$ is estimated from the experimental data for FeCl₃ in aqueous solutions [Ref. S1]. Fig. S3 shows the dielectric constant (blue triangles) of FeCl₃ aqueous solutions at different concentrations deduced from the corresponding refractive index [Ref. S1]. $\varepsilon$ changes almost linearly as a function of FeCl₃ concentration. We extrapolate the data points at 0% (pure water) and 100% (pure FeCl₃) as 1.78 and 1.86, respectively. For $\varepsilon=1.86$, Fig. 3 of Ref. S2 gives $f(e^2/2\varepsilon_0\varepsilon\omega_f)\sim0.09$. If the refractive index of FeCl₃ fluctuates 20%, then $\varepsilon$ fluctuates 40%, and $|E_F|$ fluctuates $\sim13\%$. Therefore, $|E_F|$ is not very sensitive to the $\varepsilon$ 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