Supporting Information

Enhanced Shubnikov-De Haas Oscillation in Nitrogen-Doped Graphene

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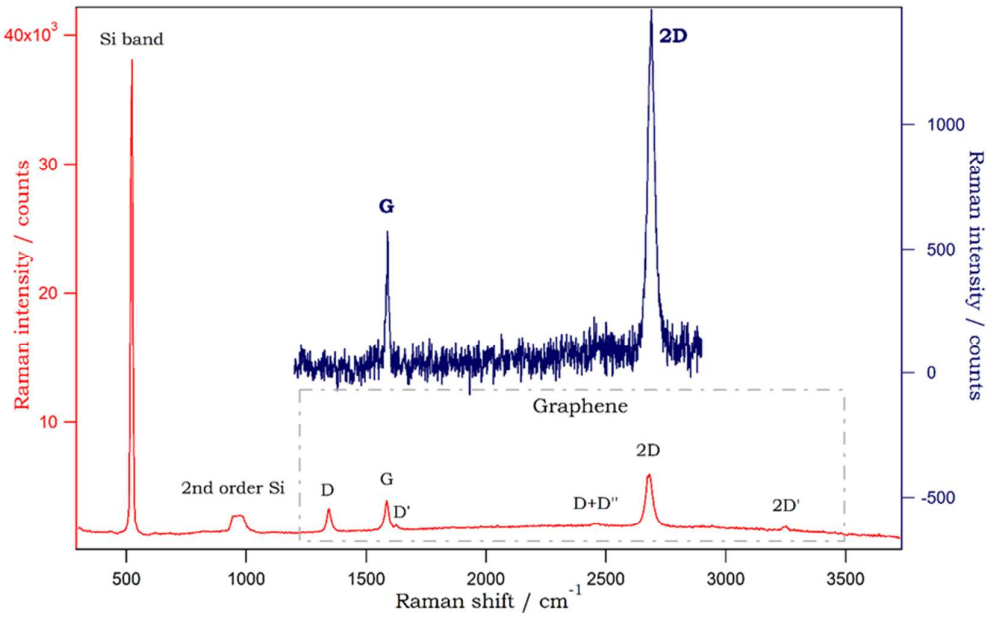

Figure S1. Typical Raman spectra of the pristine (blue line) and N-doped graphene (red line) on SiO_2/Si substrates.

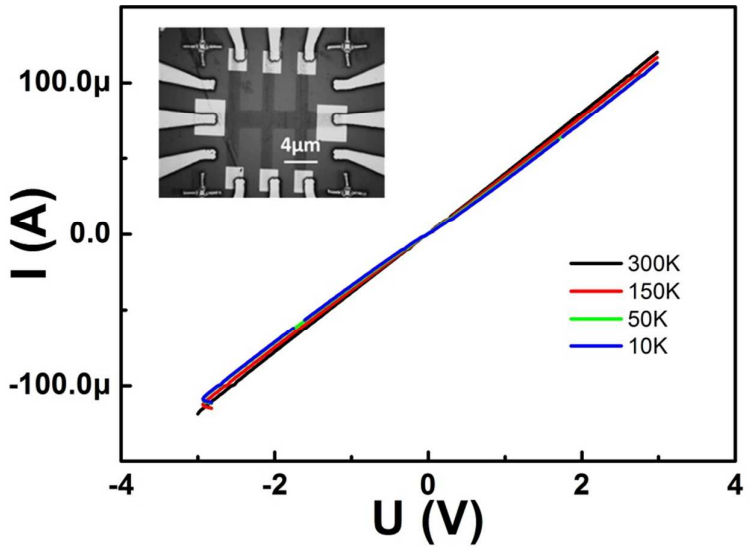

Figure S2. Temperature dependent I-V curves for a two-terminal N-doped graphene device. **Inset:** a typical scanning electron microscopy image of an N-doped graphene device.

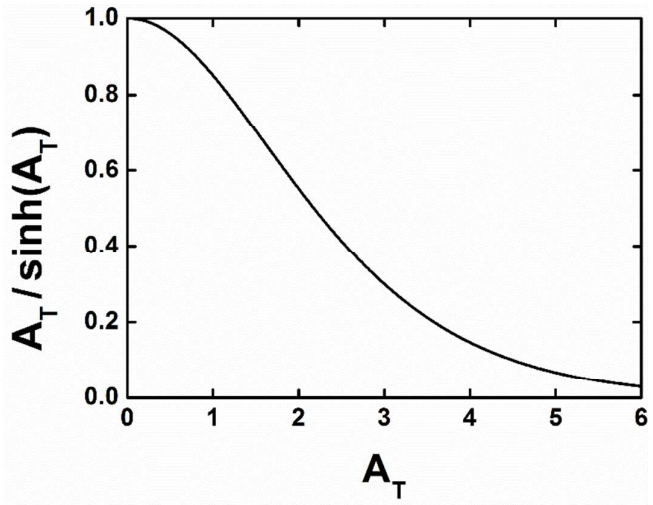

Figure S3. Calculated thermal smearing factor of 2DEG varying with A_T.

DFT calculation:

In our calculations, we consider a 6x6 supercell containing 72 atoms. The electronic structures were calculated using the Vienna ab initio simulation package (VASP). We employed the projected

augmented plane wave method and valence configurations of $2s^2 2p^2$ for C and $2s^2 2p^3$ for N were used. The lattice constant was set to be 2.46 Å and a cut-off energy of 450 eV was used for geometry optimization and energy calculations. 5x5x1 and 21x21x1 Monkhorst–Pack k-point grids were applied to sample the Brillouin zone for geometry optimization and energy calculations, respectively. To study the electronic structure of pyridine-like N-doped graphene, we removed carbon atoms from the pristine graphene or replaced them with N atoms and then performed structural relaxation for the entire structure.

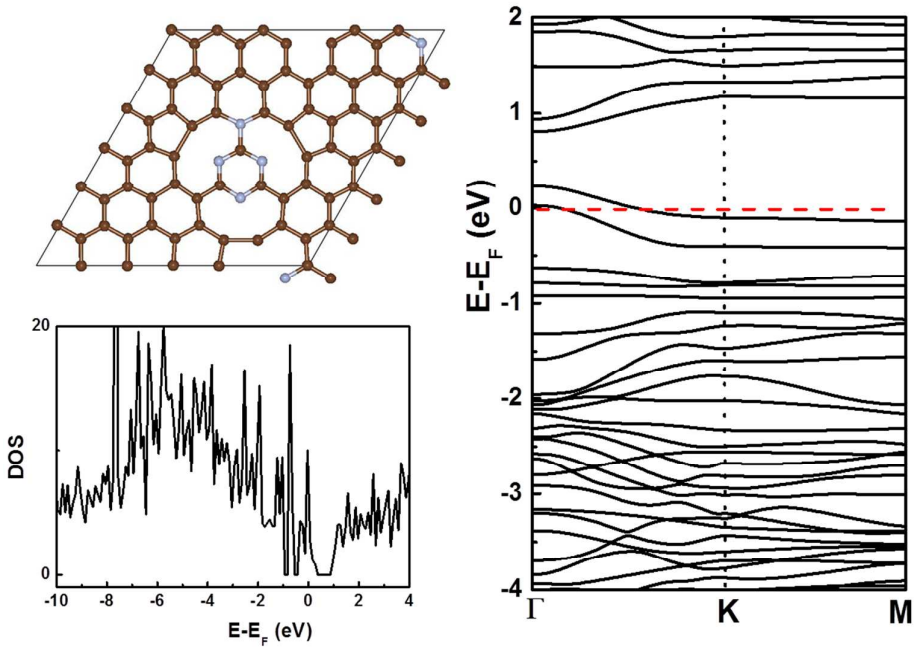

Figure S4. First principle calculations demonstrating p-type states in pyridine-like N-doped graphene. Atomic structures and corresponding density of states and band structure for N-doped graphene.