Electronic supplementary information

Sensitivity enhancement of graphene Hall sensors modified by single-molecule magnets at room temperature

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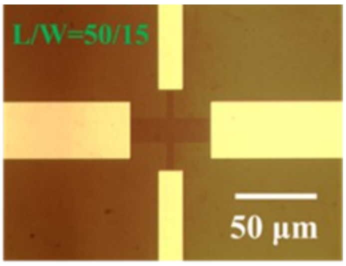

Figure S1. optical image of the graphene hall sensor.

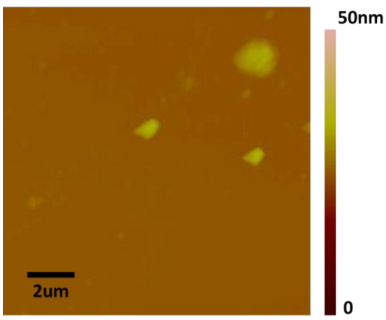

Figure S2. AFM image of $TbPc_2$ molecules deposited on SiO_2/Si substrate.

Figure S2 represents the AFM results of $TbPc_2$ molecules deposited on bare SiO_2/Si substrate. Only few SMMs tend to adhere on SiO_2 substrate.

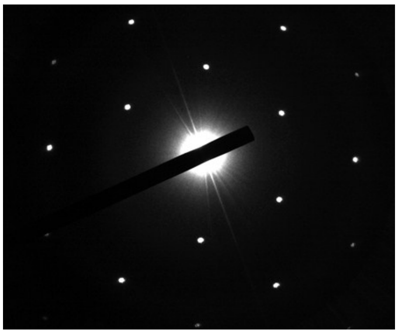

Figure S3. TEM image of as-grown graphene transferred onto a copper TEM grid.

We fabricated magnetic Hall Elements based on chemical vapor deposition (CVD) grown graphene. The channel length and width ratio is 50/15 um, as shown in Figure S1. Our graphene is of good quality, and the sample has single-crystalline feature based on the SAED results (Figure S3).[1]

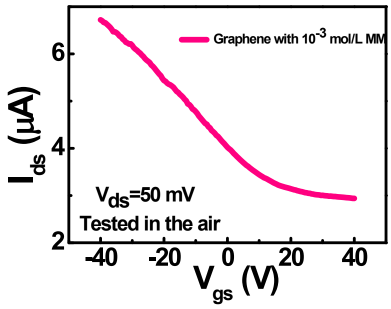

Figure S4. The back-gate transfer characteristics of the MM-modified GHEs with 10^{-3} mol/L.

Figure S4 represents the back-gate transfer characteristics of the GHEs with 10^{-3} mol/L SMMs modifications. The strong p-type carrier charge transfer is originated from the residue dichloromethane of the modifications processes. At the same time, the mobility significantly declines to as low as 420 cm^2/Vs. This is due to the additional scatterings of clusters and crystallizations formed at high SMMs concentrations.[2]

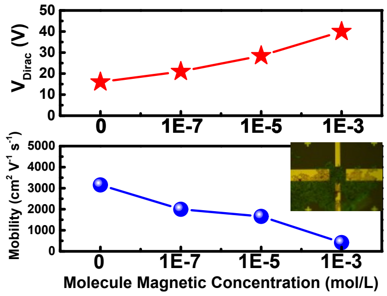

Figure S5. The graphene-hybrid device Dirac point and mobility change at three SMMs different concentrations in DCM. The inset shows the clusters of SMMs.

Figure S5 shows the concentration dependent Dirac point voltage and mobility of GHEs. The Dirac point shifts positively and the mobility decreases with increasing SMMs concentration. The p type charge and scatterings are introduced during the SMMs modifications process.

Notes and references

1. D. Geng, H. Wang, Y. Wan, Z. Xu, B. Luo, J. Xu, G. Yu, Adv. Mater. 2015, 27, 4195.
2. M. Lopes, A. Candini, M. Urdampilleta, A. Reserbat-Plantey, V. Bellini, S. Klyatskaya, L. Marty, M. Ruben, M. Affronte,W. Wernsdorfer, N. Bendiab, ACS Nano, 2010, 4, 7531.