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.
We fabricated magnetic Hall Elements based on chemical vapor deposition (CVD) grown graphene. The channel length and width ratio is 50/15 μm, 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 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\(^2/V\)s. This is due to the additional scatterings of clusters and crystallizations formed at high SMMs concentrations.\(^2\)
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**