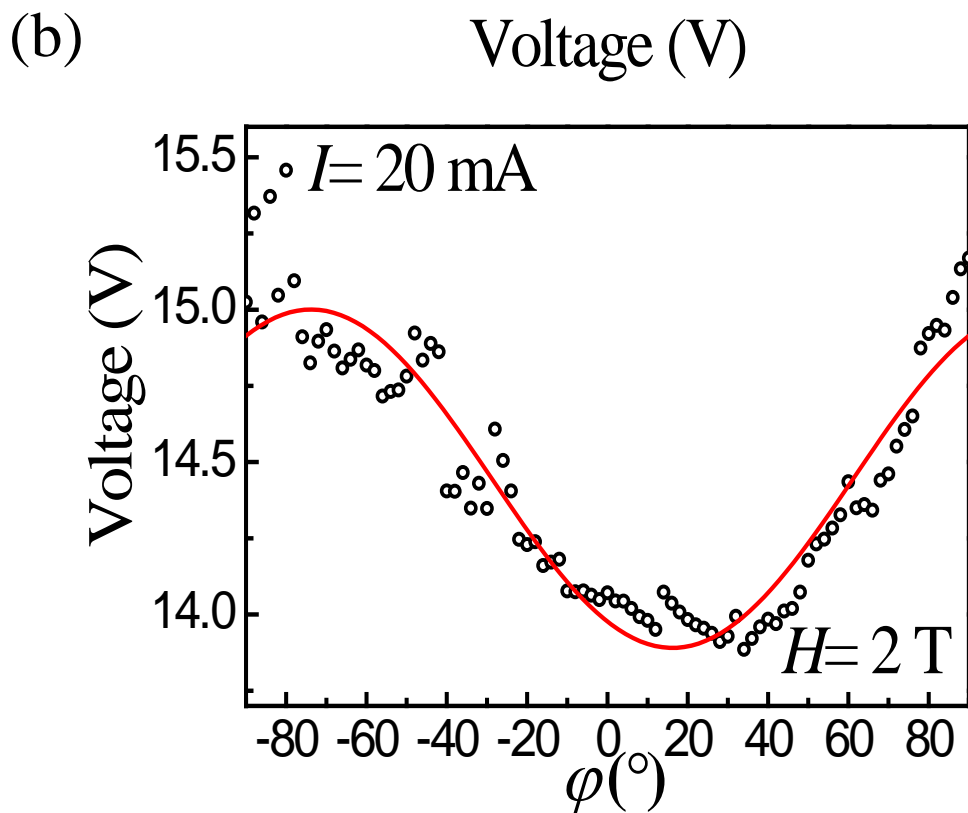
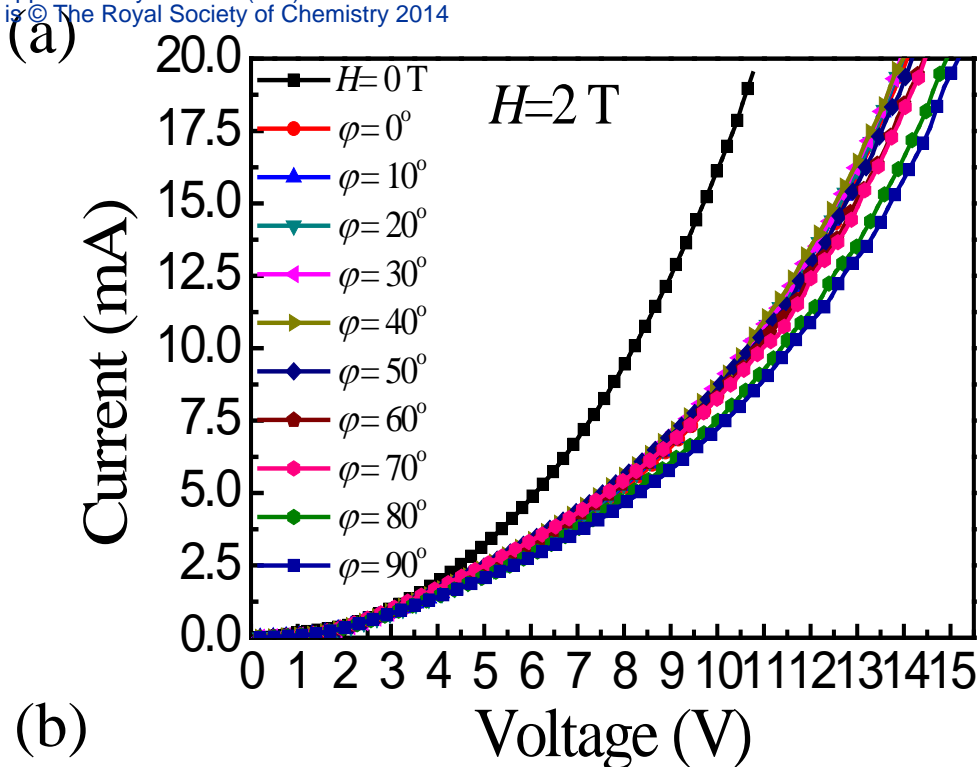
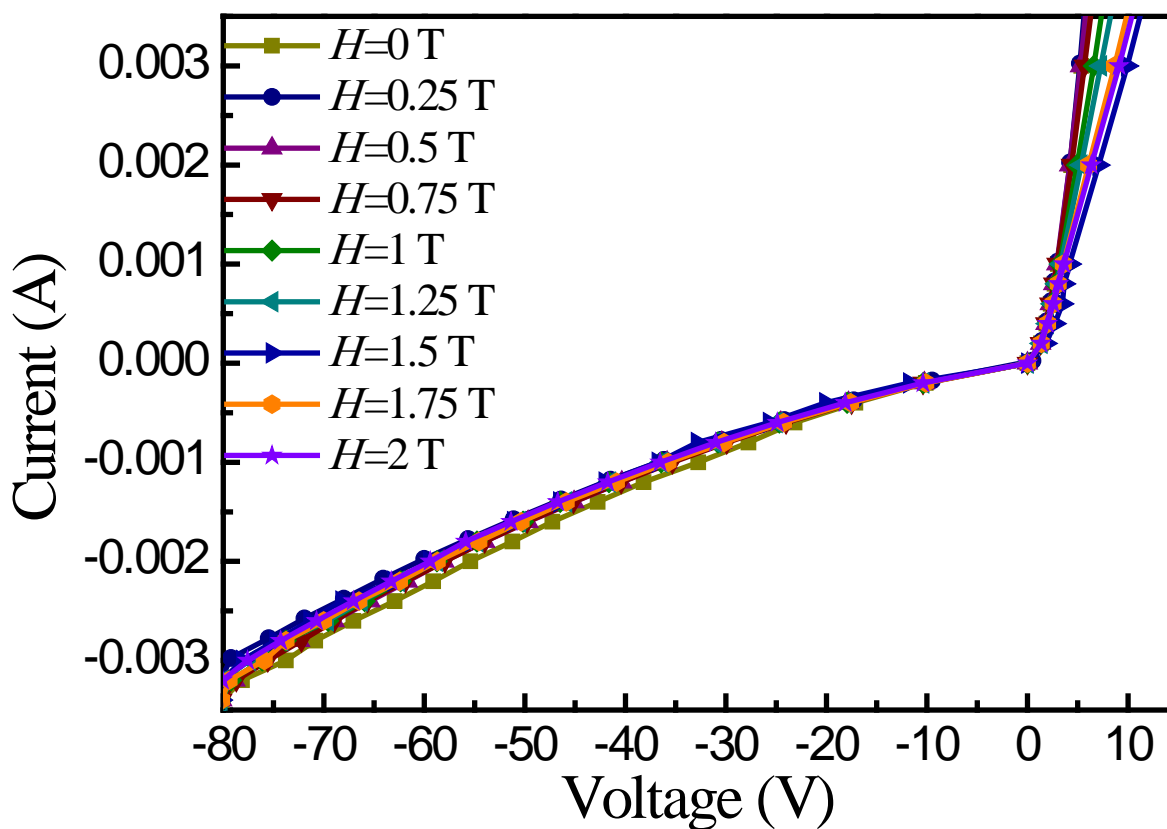


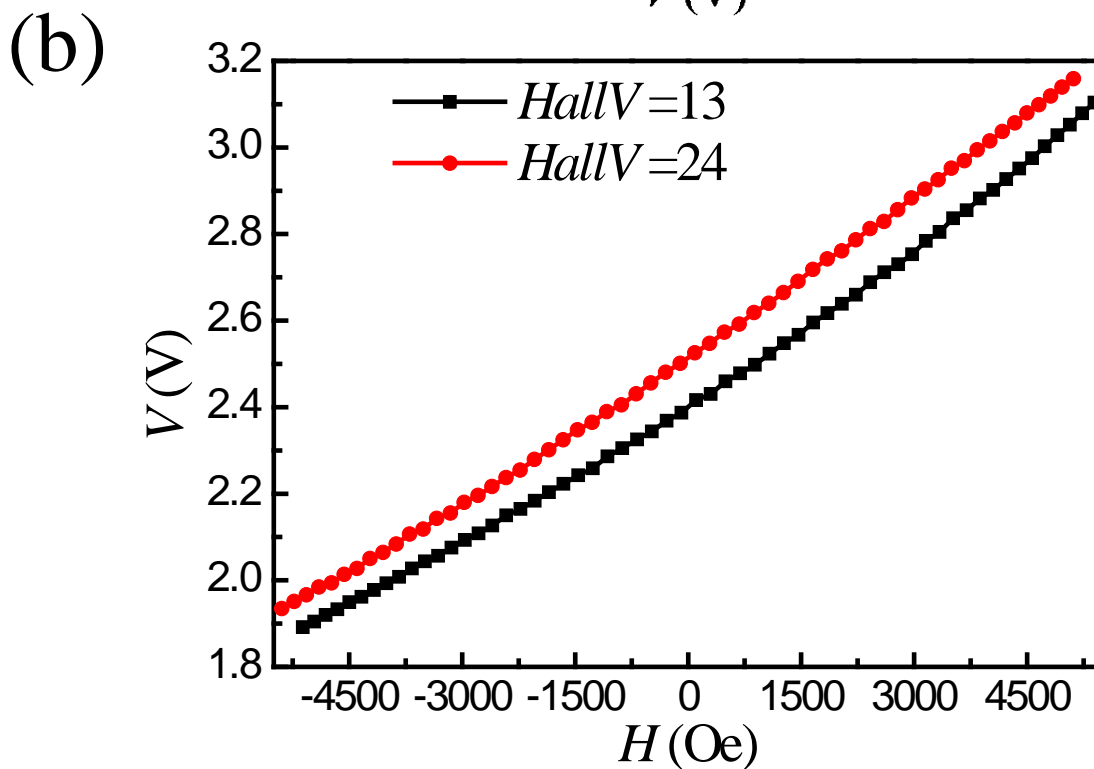
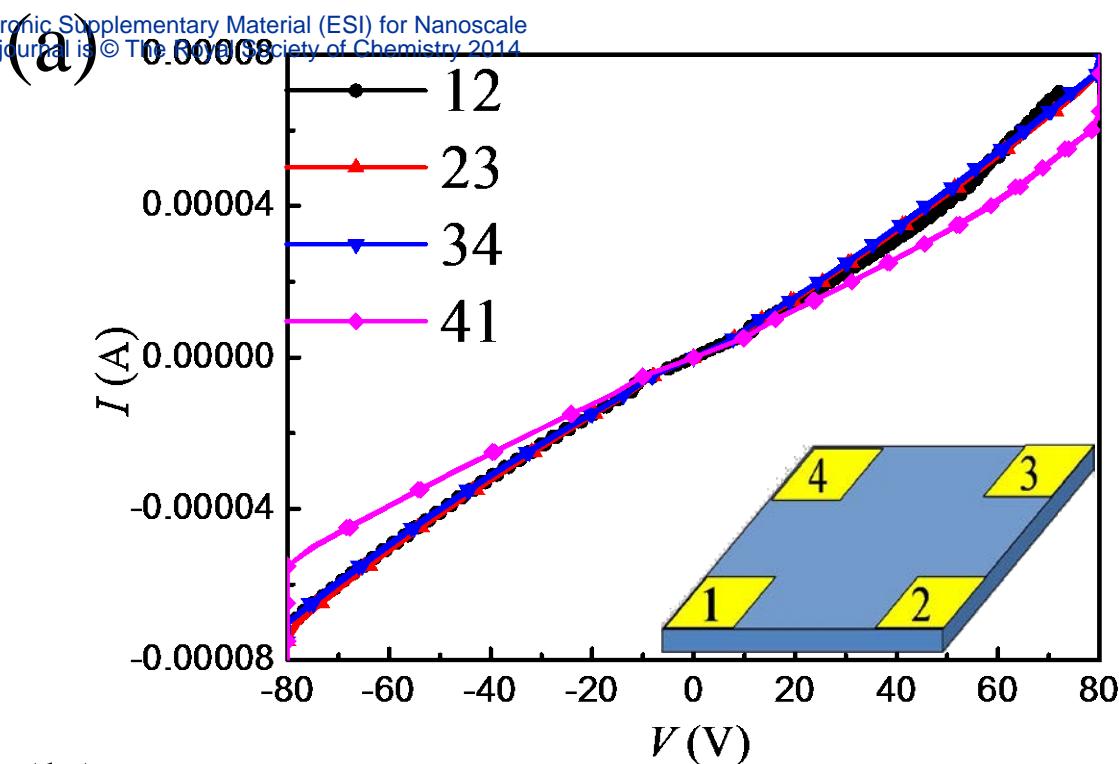
S. 1(a) shows the  $I$ - $V$  characteristics of the  $p$ - $n$  junction device for various magnetic field orientation in the x-z plane at room temperature. (b) shows the corresponding anisotropic MR curves at specified current  $I = 20$  mA.



S. 2(a) shows the  $I$ - $V$  characteristics of the  $p$ - $n$  junction device for various magnetic field orientation in the  $x$ - $y$  plane at room temperature. (b) shows the corresponding anisotropic MR curves at specified current  $I=20\text{ mA}$ .



S.3 The  $I$ - $V$  curves at negative bias with various magnetic field. No obvious MR effect was observed at the negative bias.



S.4(a) The  $I$ - $V$  curves of the sample in various electrodes without magnetic field. The size of the sample is  $2.9 \text{ mm} \times 2.26 \text{ mm}$ . And the thickness is  $0.14 \text{ mm}$ . (b) The current  $I = 0.01 \text{ mA}$  pass through electrodes 13 or 24, and the hall voltage was measured between 24 or 13, respectively. Both sides of the sample were grinded on the manual grinding disc (Gatan 623). The thickness of sample was grinded from  $0.50 \text{ mm}$  to  $0.14 \text{ mm}$  and the oxidation layer was etched by the HF solution.