Hybrid organic spin valves

Popinciuc, Mihaita

A

Electrical characteristics

A.1 Low temperature charging current correction

At low temperatures and at low voltages (measurement speed of 1 V/s) the measured current is dominated by the charging current, which appears as large hysteresis at low voltage (current reversing sign at positive voltages for the retrace). Current-voltage characteristics at room temperature show very little hysteresis (the true current is much higher than the charging current). By averaging the trace and retrace curves the charging current is eliminated.

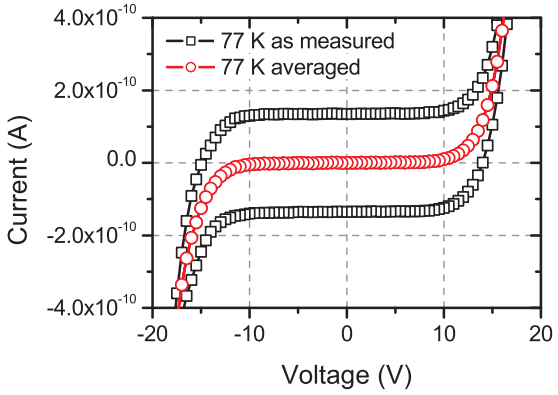

Figure A.1: Current vs. voltage at 77 K. At low voltages charging current (from capacitive coupling) dominates the IV. By averaging the trace and retrace the true current can be deducted (red circles).

A.2 Current drift correction

Spin valve measurements (current vs. magnetic field at fixed voltage bias) suffer from drift, see Fig. A.2(a) where several magnetic field sweeps taken in the same bias condition (−0.75 V) are shown. One of the reasons for this drift is that the resistance of pentacene follows the temperature changes in the measurement room, i.e. the resistance was peaking in the night while during the days, when the temperature in the room was higher, the pentacene resistance was lower. Some

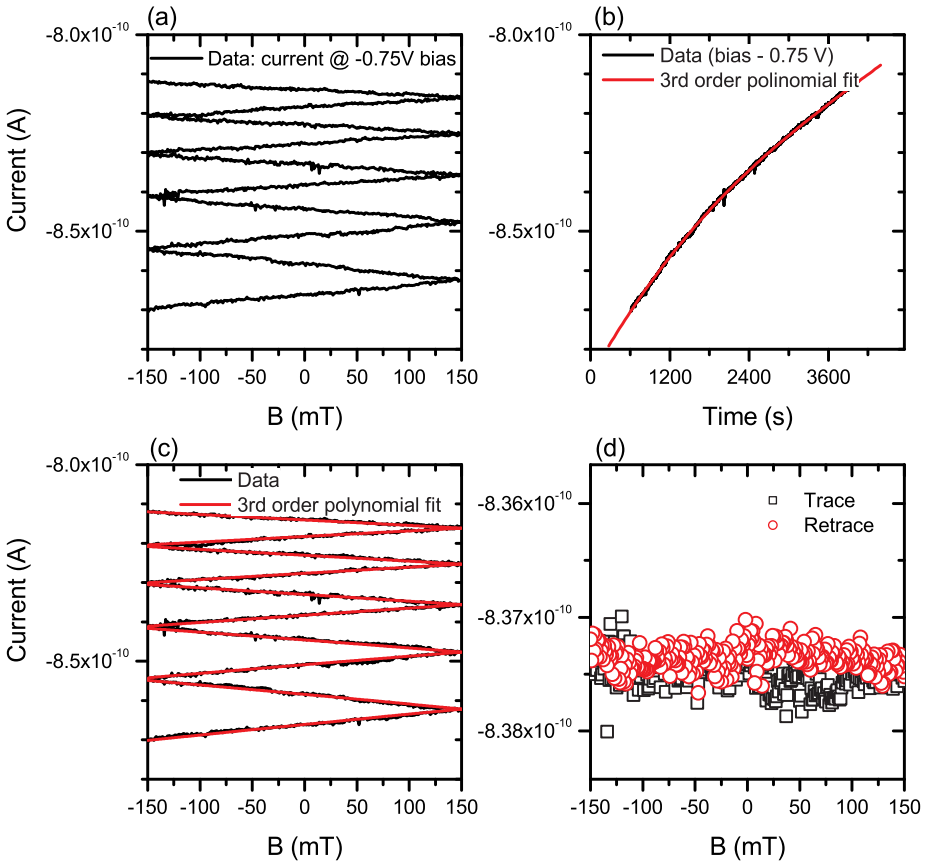

Figure A.2: (a) current trough the Co/pentacene/Co layered structure at a fixed bias of −0.75 V as a function of the B field (5 sweeps back and forth). (b) the raw data as function of time and the 3rd order polynomial fit. (c) the raw data and the polynomial fit as a function of B. (d) the data after drift correction. *Trace (retrace)* stands for sweeping the B field from negative (positive) towards positive (negative) values.

of the measurements were performed in an air conditioned room and there also a small drift was registered.

The measurements also take place in time, see Fig. A.2(b) where the data of panel (a) is presented as a function of time. In this particular case the drift can be well described by a third order polynomial. Both the raw data and the polynomial fit are shown in fig.A.2(c) as a function of B. The (polynomial) drift is then subtracted from the raw data, and the median value of all data points is added to the result of substraction. Several, same direction B field, sweeps were then averaged. The result of this procedure is displayed in fig.A.2(d). The degree of the polynomial is kept as low as possible (a high order polynomial would probably follow better the shape of the curve possibly removing the magnetoresistance features). The quality of the fit was judged by eye.