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Example for drift correction and importance of magnetfield dependant Hall measurement

Shown is one (SC*8@A_001.HRA) measurement of a TCO similar layer on glass with different evaluations and corrections.

The upper picture of figure 1. gives the I/V curves of the v.d.Pauw configuration measurement, the botton picture give the I/V curves in Hall configuration at the highest (+B) and lowest (-B) Magnetic field.

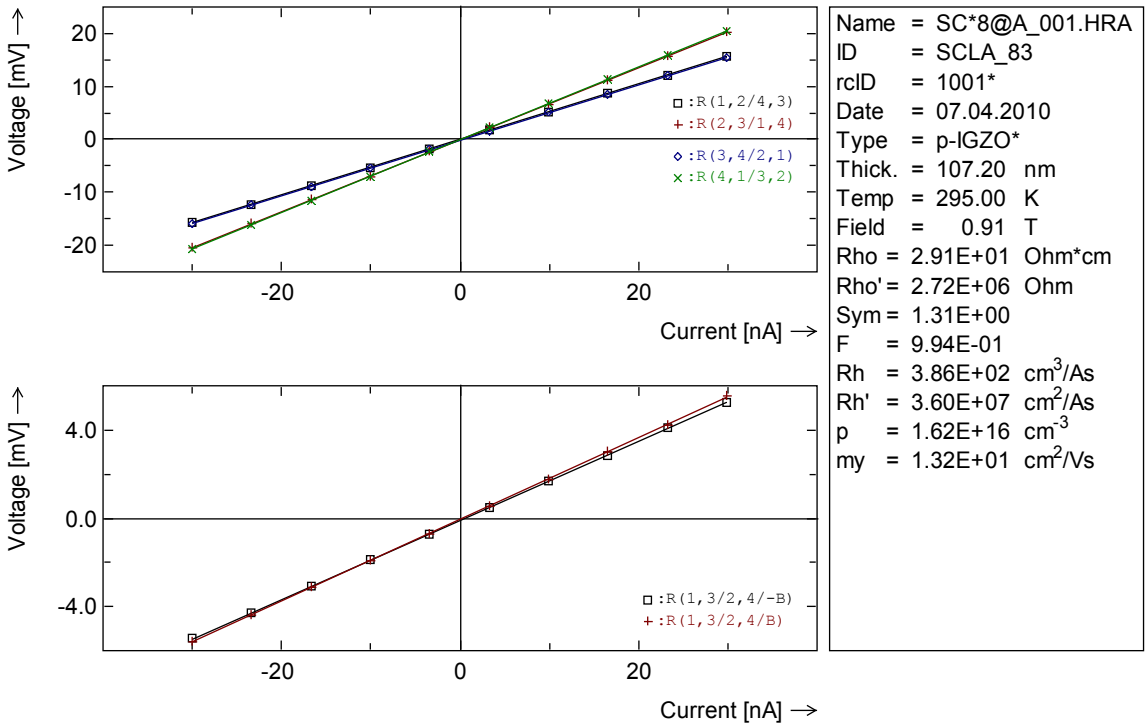

fig. 1: Standard v.d.Pauw and Hall evaluation of measurement SC*8

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It is to see, that the difference between the I/V curve (resistances) at max. magnetic field (B+) and min. magnetic field (B-) is compared to the misalignment resistance (normally know as a

misalignment voltage, but we see it as a misalignment resistance due to the I/V curve measurement) quite small. The result on the right side calculated from the measured resistances at the different configurations (see. our Application note) is definitivly correct for the van der Pauw resistivity, but also not understandable (and definitly not correct) for the Hall concentration and the mobility.

What has happend during the measurement is better to see (and only hereby) when the Hall measurement has been done under variation of the magnetic field (fig.2:).

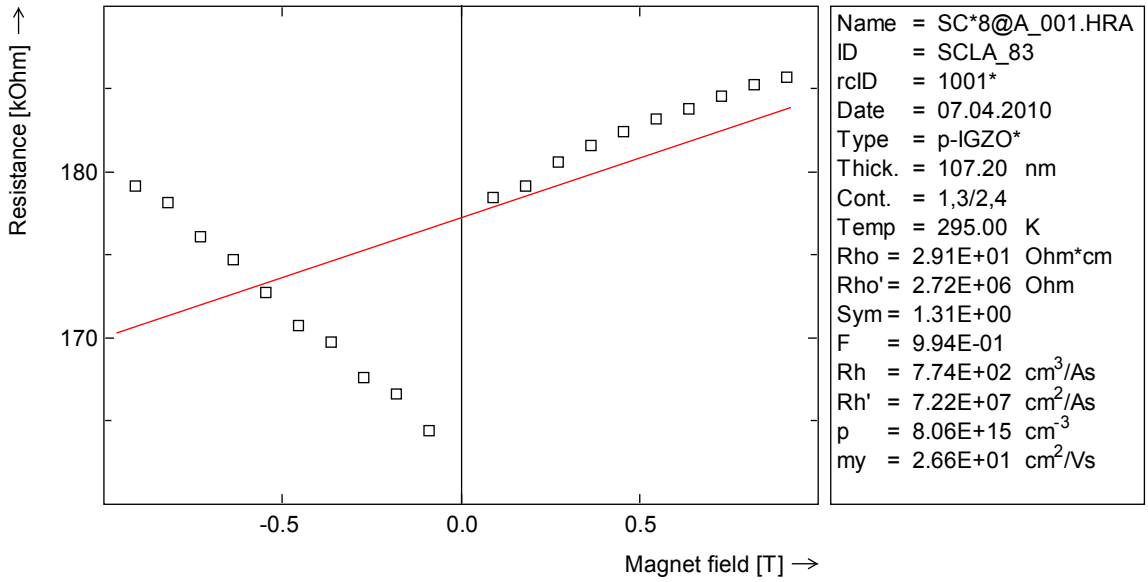

fig 2: The Hallresistance (slope of the I/V curve in Hall configuration) vers. the magnetic field.

For "normal" measurements (see. our Application note) the resistances should variate with the magnetic field in a linear way. The slope gives the Hallcoefficiant and leads then to the concentration and mobility.
For the measurement of this material we do have a not linear and not stetic behaviour. In addition to the magnetic field dependance we have a time dependance change of the Hallresistance.

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Supposing a linear behaviour of the timedependance we can correct the measured data just to get only the magnetic field dependance of the Hallresistance.

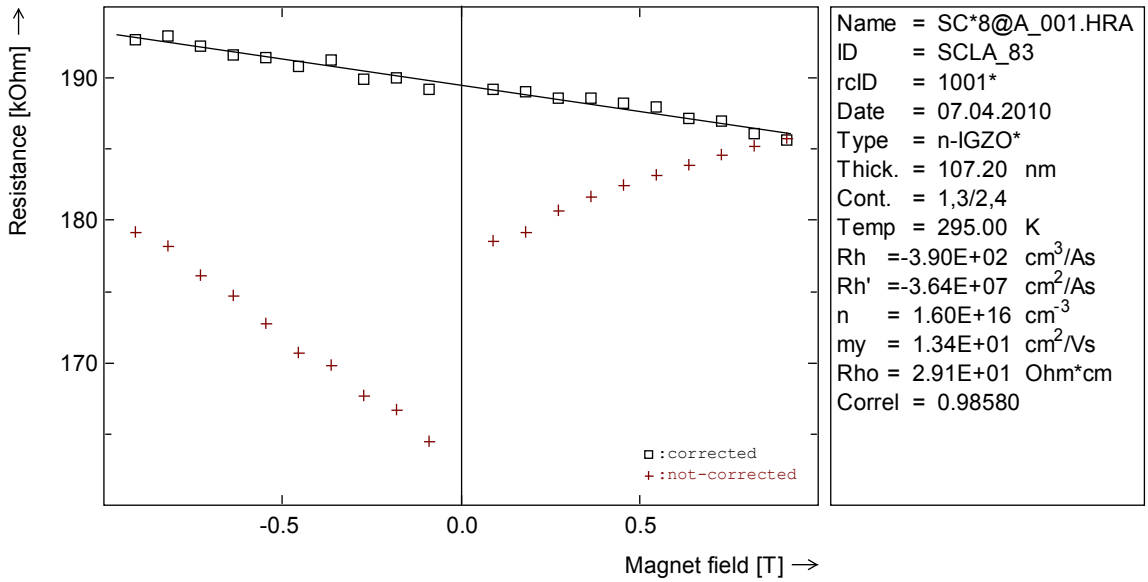

fig 3: The Hallresistance vers. the magnetic field. As measured (red crosses) and corrected.

The linear regression over the corrected data gives now a correct Hallcoefficiant and reliable data for the Hallconcentration and mobility. We do have implemented in the RH 2030 software a lot of possibilities to analyse these kind of behaviour of the measured layers.

Using our RH2035 van der Pauw and Hall system or any other permanent magnet system, we only get the curves at fig.1. We do not have in any case the possibility even to see that there is something in addition.

We recomment therefore for completely unknown layers and materials our RH2030 van der Pauw and Hall measurement system and the RH2035 for well known layers from standard processes to check routinesly the resistivity, concentration and mobility of these layers.