PPMS - TRANSPORT AND MAGNETIC MEASUREMENTS

PPMS - “NOVATECS” Open access facility

Environment: « PPMS - 9 T » from Quantum Design Inc.
Magnetic field [-9 T; 9 T] ; residual ~10e-4 T
Temperature: [1.9 K; 400 K] in standard mode
[300 K; 1000 K] with “oven zirconia sticks”
Chamber: Helium atmosphere at low temperature
~8 Torr in standard mode and <1e-3 Torr with activated cryo-pump



NOVATECS

Vibrating Sample Magnetometry (VSM)

1.9 K - 400 K VSM:

Small bore option (VSM SB): sample < 3.5 mm large; measured sensitivity 3e-6 emu
Large bore option (VSM LB): sample < 5mm large for cylinders and 10 mm for thin films; measured sensitivity 1e-5 emu

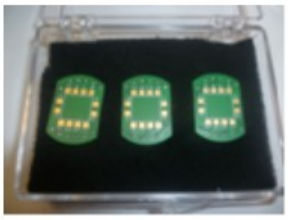
300 K - 1000 K VSM (VSM oven):

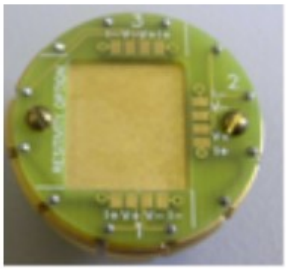
Based on a small “oven integrated” zirconia stick with thermometer (10 mm large); accuracy 0.5 K.Working only with cryopump activated and measured sensitivity 1e-5 emu



DC resistivity option

[1.9 K; 400 K] temperature range, [-9 T; 9 T] magnetic field
- H perpendicular to sample holder (“puck”)
- or electro-optical probe with manual rotation with H direction from 0° to 90°
Sample space 8×9 mm2 for 3 independent “4-point” measurements
Max. resistance < 2 M

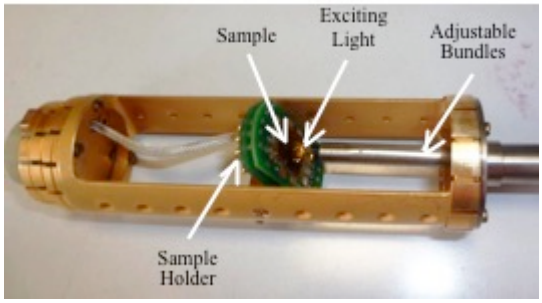




Time-resolved luminescence mesurements under strong magnetic field

Time-resolved luminescence measurements under a high magnetic field (up to 9 T) and with temperature control over a wide range are not feasible with most available commercial systems. Furthermore, the supporting material to be used must be non-magnetic and the required optical fibers must withstand low temperatures (down to 1.9 K in this case). The Physical Property Measurement System (PPMS) from Quantum Design, available on GeMaC, Versailles (France) is equipped with a customized electro-optical probe composed of three optical bundles consolidated in one non-magnetic tube. This specific system allows performing millisecond time-resolved optical measurements in a broad temperature range (from 1.9 K up to 400 K) and with magnetic fields up to 9 T,

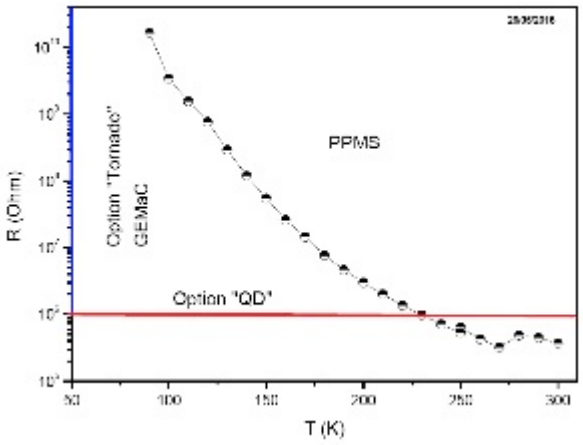
by connecting both the light source and the detector to two different optical fibers, one used to deliver the excitation light to the sample and the other to collect the emitted light from the sample. The distance between the fibers and sample is adjustable.



Sample holder

Resistivity and Hall effect for very resistive materials – "Tornado" option

Conventional PPMS allows to measure samples with a resistance up to R = 1 . This limitation precludes low temperature studies of thin layers of many oxides as well as semi-conductor diamond. In GEMaC, we have developed a special option (both hardware and software) that we call "Tornado". It allows us to perform resistivity and Hall measurements in teh Van der Pauw configuration, for samples that have a resistivity up to R=1e+10 .


R (Ohm)
T (K)
PPMS
Option "Tornado"
GEMaC
Option "QD"