Liquid Helium Plant-new facility-January, 2004

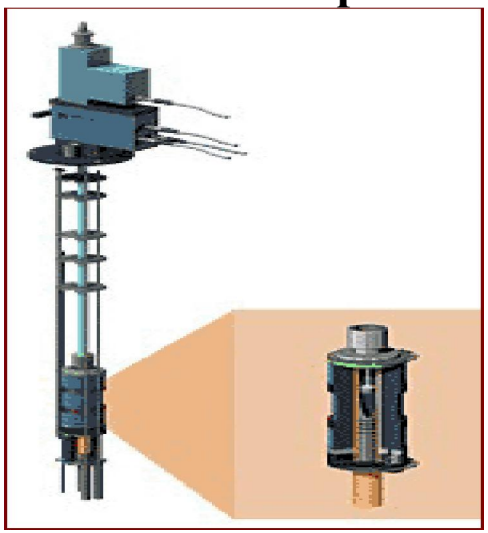
40 litres per hour with LN_2, 23 litres per hour without LN_2,
Built-in purifier upto 20% contamination: Linde, Switzerland, Model: TCF 10

Thermo dynamical properties at low temperatures : Specific heat, magneto transport at 1.5K, 10 Tesla

SQUID Magnetometer-new facility-February, 2004

(superconducting quantum interference device)

SQUID AC Susceptibility Measurement - 0.1Hz to 1KHz,
sensitivity: 2 x $l0^{-8}$ emu at 0 T
Ultra-Low Field Capability
±0.05G for the 5T or 7T magnets
Reciprocating Sample Option - DC Magnetization absolute sensitivity: 1 x 10^{-8} emu@2.5kOe
Continuous Low Temperature Control/Temp. Sweep Mode-
Sweep rate: 0.001 - 10 K/min.
Horizontal & Vertical Sample Rotators



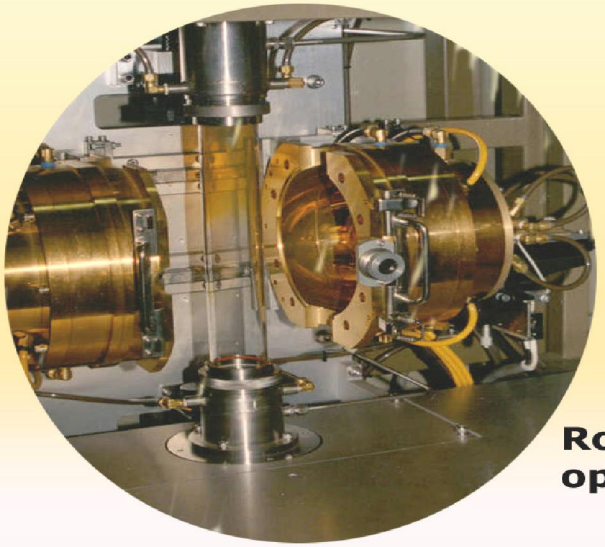
Pulsed Laser Deposition system: new facility-2003

To prepare low dimensional structures and cold deposited nanoparticles:

Features:
Excimer Lasers: KrF
Energy: 600mJ
Multitargeted vacuum chamber




Travelling Solvent Floating Zone (TSFZ) Image Furnace



Specifications

Item	Specifications
Heat source	1.5 KW halogen lamp (two)
Ultimate Temperature	2050 ^{o}C
Max. crystalline diameter	10mm (depending on samples to be heated)

Rotation of the shaft both in the same direction or opposite directions ~0.5 mm/hr to 300 mm/min .

Programmes in progress

Growing Single crystals of $La_{1-x}A_xMnO_3$ (A=Sr , Ca and Ba) , $R_{1/3}Sr_{2/3}FeO_3$ (R=La , Pr and Nd) , Sr_2FeMoO_6.

Single crystal of $La_{0.8}Sr_{0.2}MnO_3$ grown Using Image Furnace

Low Temperature Laboratory

Technique Used
(instrumentation at SINP)

A) AC SUSCEPTOMETER

- **$\chi(\omega, T, H_{ac}, H_{dc})$; χ' and χ''**
- **$\omega \sim$ 5Hz – 50 KHz**
- **T(K) 4.2 –300 K**
- **H_{ac} (hrms) ~ 10 – 30 Oe**
- **$H_{dc} \sim$ 50 Oe**
- **Enhancement technique (New)**

$$H_{ac}=h_1 e^{i\omega_1 t} + h_2 e^{i\omega_2 t}$$

B. DC Magnetometer

•M (H,T) under zero field cool and field cool method .
•Hysteresis
•Thermo remanent magnetization (TRM) ; TRM (temperature , time)

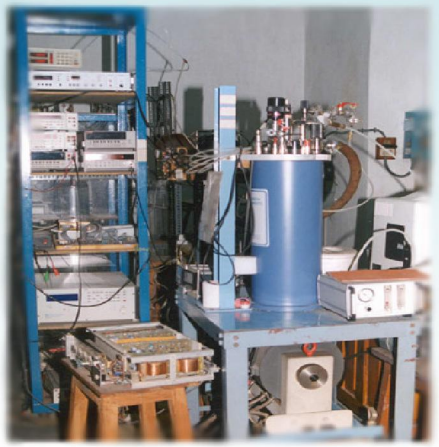
Reference: -

AC susceptometer - Review of Scientific Instruments **68** 2834 (1997)
DC magnetometer – Review of Scientific Instrument **67** 789 (1996)

STATIC AND DYNAMIC RESPONSE OF COMPLEX MAGNETIC MATERIALS :

Program :

❖ Frustrations , glassy behavior , Intra clusters ferromagnets in disordered magnetic materials .
❖ Effect of grains , particle size , interface structure , micro crystalline , magneto crystalline anisotropy in spinel oxide.
❖ GMR in magnetically inhomogeneous media.
❖ Domain wall pinning , domain wall motion & rotation



NUCLEAR MAGNETIC RESONANCE LABORATORY

Principle equipment:
Pulsed NMR Spectrometer
Equipped with :

- 5-100 MHz freq synthesizer
- 250W and 1000W broadband power amplifiers
- 0-2.3 T variable field electromagnet
- 7 T superconductoing magnet
- Cryostats for temperature variation studies in the range 3-300K
- Home built NMR and matching networks

Research Program

1. Spin state transitions in pure and doped rare-earth cobalties
2. Structural phase transition in single crystals of transition metal fluoro-silicates
3. Storage and dynamics of hydrogen and deuterium in ternary intermetallics
4. Hydrogen induced modifications in electronic and magnetic properties of intermetallics
5. Magnetic phase transitions in (a) low-dimensional, and (b) geometrically frustrated systems

6 Electronic and magnetic properties of layered TM oxide, heavy fermion and Kondo systems

MICROWAVE SPECTROSCOPY LABORATORY

MICROWAVE / MILLIMETERWAVE SPECTROMETER

Radio frequency – Microwave Double Resonance technique.
Microwave-Microwave Double Resonance technique. Millimeter wave Spectroscopic technique.
Frequency range:-
12 .0 –100.0 GHz (MW/mmwave)
1.0 –1000.0 MHz (RF)

Information obtained:
Molecular structure, Conformation, Internal rotation etc. of stable and transient molecules.

INFRARED – RADIOFREQUENCY DOUBLE RESONANCE SPECTROMETER

- Infrared –Radiofrequency Double Resonance technique.
- Co_2 laser (Built at SINP)
- 9.6 μ -10.6μ range (Laser)

Ø 1.0-1000.0 MHz (RF)

Information Obtained :
Molecular properties in excited vibrational state .

ECMP division Major equipment under 11th plan PCS Project (2007-2012)

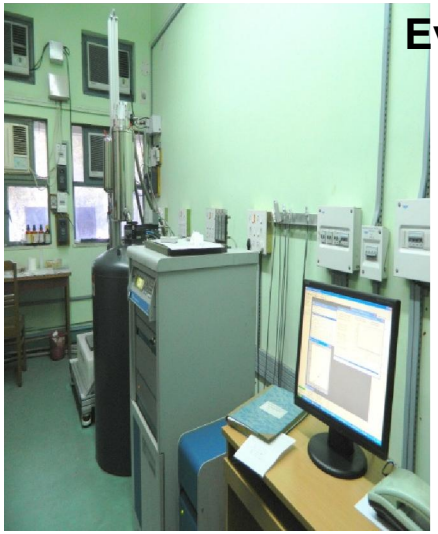
UHV system #140

SQUID-VSM #139

Evercool II M-H High pr. #246

9T RT bore # 140

9T Thermal, transport #242



PPMS #242A

XRD (10- 1500K) at 18Kw

Low field (< 1 Oe) M-H #246