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Certificate No Q4118

HelioxVT

Sample in vacuum 1 K pot-free ^{3}He refrigerator

The HelioxVT is specifically designed to fit into Oxford Instruments Superconductivity's variable temperature inserts (VTI) with 30 mm access. Operated in the cold gas environment of a variable temperature insert, this removes the need for the 1 K pot on the insert. This eliminates the presence of liquid helium in the sample horizontal plane. These unique features offer two key benefits:

- Extension of sample temperature range to below 280 mK of existing or new VTI's
- Ideal for neutron or X-ray scattering experiments

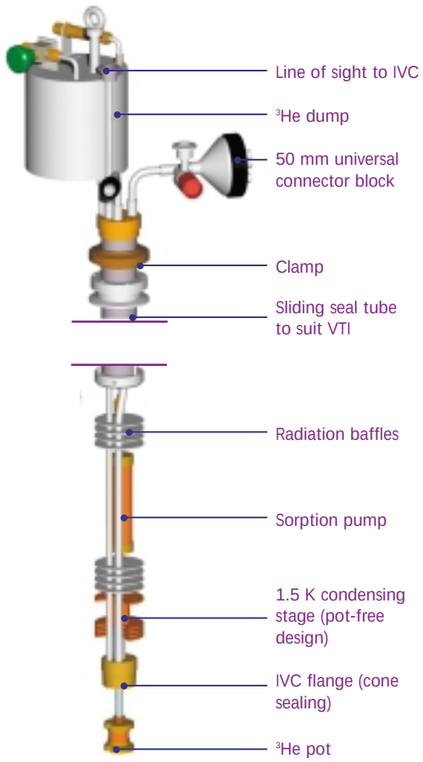

Figure 1: The HelioxVT system

Components

A complete system consists of:

- An HelioxVT insert (Figure 1)
- An ITC^{503} temperature controller to operate the ^{3}He refrigerator
- A variable temperature insert (VTI) with pump and ITC^{503}

Features and Benefits

- Used in a VTI environment – extends temperature range to temperatures below 280 mK.
- No liquid helium in beam plane – absence of cryogen in the sample horizontal plane enables scattering experiments (neutron or X-ray) to be undertaken without disruptive beam dissipation or reflection from Helium
- Small diameter insert – specially designed 30 mm insert permits a very compact and small footprint system.
- Wide temperature range – temperature can be controlled from 280 mK up to 6 K (or higher with high temperature option)
- Seamless integration – with Oxford Instruments Superconductivity designed VTI and split pair type superconducting magnets.

Operation

Figure 2 represents a schematic of the HelioxVT running in a VTI. The HelioxVT insert can be treated like any sample rod for a variable temperature insert. Once loaded, the insert is cooled by the VTI from 300 K down to around 10 K using exchange gas. The ^{3}He gas contained in a small dump sitting on top of the insert is then condensed at around 1.5 K. Once the ^{3}He pot has reached a stable temperature and condensation is completed, the adsorption pump will start to cool the ^{3}He pot and experimental set-up to below 300 mK. The condensation and the cool down time typically require less than 1 hour.

Performance

Despite its exceptional compactness, the HelioxVT can maintain temperatures of below 280 mK for more than 40 hours (with no applied heat load). In addition, the integrated sliding seal enables complete ease of use and flexibility of operation. Available cooling power of more than 50 µW at 350 mK can be maintained for over 4 hours, whilst typical regeneration time is around 40 minutes.

Experimental access

The insert is equipped with various diagnostic sensors, including a carbon sensor on the sorption pump and uncalibrated RuO_2 sensor on the 1.5 K condensing stage and ^{3}He pot. A universal (50 mm) connector is fitted to the top of the insert. This connector is equipped as standard with two 10-way Fischer connector (diagnostic and customer wiring) 5 twisted pairs, 0.1 mm diameter constantan wires terminated at the ^{3}He pot.

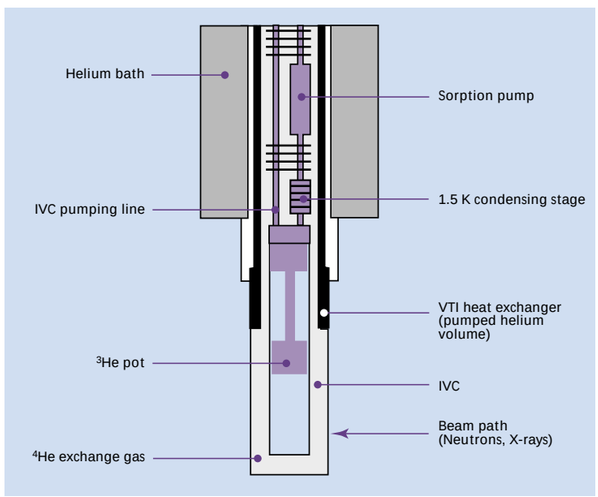

Figure 2: Operating principle of HelioxVT

HelioxVT

Standard Specification		Description
HELVT30SYS	Base temperature	<280 mK for >24 hrs (no applied heat load)
	Cooling power	<350 mK for >4 hours with 50 µW applied heat load
	Temperature range	Base temperature to 6 K
	Temperature stability	Below 1.2 K: <+/-3 mK
	Thermometers	Uncalibrated RuO_2 sensors on 1 K stage and ^{3}He pot. Carbon resistor on sorption pump.
	^{3}He regeneration time	40 min
	Hold time at base temperature	>24 hours
	Sample access	Via IVC; Inner diameter 25 mm
	Experimental wiring	10-way loom wired in twisted constantan pairs to 10-pin socket at ^{3}He pot

High Temperature Upgrade		HelioxVT extended operating temperature range
HELHT	Thermometers	RhFe or Cernox™ sensor to ^{3}He pot or probe for operation above 6 K.
	Temperature range	Up to 80 K
	Temperature stability	+/-100 mK at T>1.5 K

Standard Options	
SHM	Sample holder for high field magnet
SIVCT	Spare IVC tail, to suit magnet if required

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