Activities at Cryogenic Center and Low Temperature Physics at Ohio State University

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The Physics Department at Ohio State University maintains a Cryogenic Center which supplies the liquid helium needs for the Science and Engineering Colleges at the University. The center uses a Collins Model 119 Helium Cryostat (purchased in 1958) which has been modified to incorporate a Crosshead Flex and Remote Delievery Tube capability. Before I review the programs and the volume of helium used by each group, the various differences between the proceedures used at OSU and Osaka Univ. will be reviewed.

The liquid helium is transfered from 50 liter portable dewars into the experimental dewar in situa at the labaratory, as opposed to the situation at Osaka Univ. where the experimental dewar is brought to the cryostat for the transfer. While our system leds to much higher losses of helium because of the extra storage and handling procedures, it increases the flexibility of the experimental apparatus as well as placing liquid helium at the disposal of the user 24 hours a day 7 days a week as against the limited schedule of three afternoons a week at Osaka Univ.

For purposes of accounting, the experimental group is charged for the volume of helium removed from the storage dewars, not the amount transfered into the experimental dewar as is done at Osaka Univ. As a result the volume of helium used by a given group at OSU will be correspondingly larger for the OSU groups.

The cost of the helium to the user is determined from the cost of the operation of the facility over a six months period. The salary of the operator-manager is not included in these direct costs. Since the larger users of helium have a recovery system in their laboratories, their charge is correspondingly reduced.

In the calender year 1972, 12,146 liters of liquid helium were supplied by the Cryogenic Center. Of this amount, 6156 liters were purchased as liquid

helium from a supplier while 5990 liters were liquified at the Center. The cost of the helium to the user with a recovery system was $4.35 per liter for the first six months of 1972 and $3.20 per liter for the last six months. The cost to the user without a recovery system was about $1.00 more per liter. The major cause of the higher price of helium during the first six months was due to major repair work that became necessary of the cryostat during which time it was necessary to purchase all of the helium used.

The following table lists the users of helium, their area of interest and the amount of helium used in 1972.

		Liters
Department of Physics		
Edwards	He^3-He^4 Mixtures	3739
Gaines	Nuclear Magnetic Res.	1340
Rao	IR Molecular Spectroscopy	1290
Wigen	Electron Spin Resonance	729
Bell	Fourier Transform Spectroscopy	693
Tough	Disipative Effects in HeII	432
Yaqub	Kapitza Resistance at Metal Surfaces	330
Mate	Properties of Liquid He^4	275
Garland	Electron Transport in Metals	107
Erickson	Neutron Diffraction	47
Jastrum	Mössbaur	22
Heer	Optical Physics	20
Department of Electrical Engineering		
Swartz	Transport Phenomena in Semiconductors	220
Anderson	Optical Spectroscopy of Solids	219
Battelle		
Brog	Magnetic Resonance	63
	Total for Users	8526

The topics being investigated by the major helium users in the Physics Dept. are as follows:

Prof. Edwards

1) Surface Properties of Bulk He^4
2) Two Dimensional Fermi Gas Absorbed on a He^4 Surface.
3) Surface Second Sound.
4) Surface Tension at 0.02-2.2K and at $1-T/T_\lambda=0.0003$.

All of these experiments are performed in one of three different He^3-He^4 dilution refrigerators built by this group.

Prof. Gaines

NMR to investigate the Ortho-Para Hydrogen conversion processes in solid hydrogen. These exepriments are also performed in a dilution refrigerator.

Prof. Rao

Cooling detectors used in Infrared Molecular Investigations.

Prof. Wigen

1) Ferromagnetic Resonance and Surface Modes in YIG Films.
2) Magnetic Properties of Dilute Alloys.
3) ESR and Optical properties of Rare Earth impurities in La_2O_2S.

Prof. Bell

1) Infrared Fourier Transform Spectroscopy in Magnetic Materials at high magnetic fields and low temperatures. (Dr. Yamamoto of the Low Temperature Center at Osaka Univ. was in this group from Feb. 1971 to June 1972).
2) Cooling IR Detectors.

Prof. Tough

Superfluidity and Dissipative Effects in the flow of HeII.

Prof. Yaqub

Single particle tunnelling and the Kapitza resistance in Gallium. These experiments also use a dilution refrigeration.

Prof. Mate

Properties of Liquid Helium.

Prof. Garland

1) Low Temperature Transport Properties in Metals.
2) Thermoelectric Properties of Pure Metals.
3) Electric Current Focusing Effects in Metals in Strong Magnetic Fields.

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