new technique[19] which is believed to involve mass-transport-induced growth and simultaneous temperature-gradient annealing in a vertical ampoule 1.8 cm in diameter.

The composition x of the ingot was a function of distance along the growth direction. Slices were cut from the ingot perpendicular to the growth direction and etch polished to a thickness of about 0.50 mm. The composition x within a slice was found to be constant within the accuracy of the electron microprobe ($\Delta x = \pm 0.005$). The slices were further cut into rectangular parallelepiped wafers $1.2 \times 0.4 \times 0.05$ cm.

The samples that we will report on are from three wafers: 7B with $x = 0.149$, 7B1 with $x = 0.149$, and 8B with $x = 0.138$. The latter two were used unannealed. To reduce the acceptor concentration, wafer 7B (thickness 0.3 mm) was annealed for four days at 400 °C in Hg vapor. It was verified to be homogeneous in carrier concentration by Hall measurements on a sample progressively thinned by etching. (The unannealed wafers, cut from a large crystal, are expected to be homogeneous in thickness. Several small samples cut from each wafer showed the same carrier concentration within the accuracy of about 10% of the measurement of the Hall constant.)

Unoriented single-crystal samples, typically of dimensions $3.0 \times 0.7 \times 0.3$ mm, were cut from the wafers with a 0.005-in. nichrome-wire saw using a Carborundum-oil slurry.

Just before etching, the samples were rinsed for three minutes in turn in hot xylene, in acetone, and in hot methyl alcohol. The samples were not exposed to air but were left in the bottom of a beaker covered by a small amount of methyl alcohol. The etchant consisting of 20% bromine and 80% methyl alcohol (by volume) was poured into the beaker and agitated. The etching was stopped after about 10 sec by pouring a large quantity of methyl alcohol into the beaker. The usual, more dilute, Br-methanol etches can yield conducting surface layers, which have been observed at 4.2 °K on larger-gap semiconducting, p-type $Hg_{0.70}Cd_{0.30}Te$. The above etch[20] left no detectable conducting layer on $Hg_{0.70}Cd_{0.30}Te$ samples with resistivities as high as $10^5\ \Omega$ cm.[21] Since the resistivity of the samples discussed here was always below $10^3\ \Omega$ cm, the surface conduction left by the etching should be insignificant.

Six contacts were made to the samples by electroplating gold and then indium, as follows: The samples were held down on a microscope slide by the sharp tip of a spring-loaded tungsten wire, and the sample and most of the wire were covered by microstop (a red lacquer). When it was dry, 0.02-cm strips were cut in the microstop on the glass. These strips terminated at the sample and were peeled off, exposing the parts to be plated. Using the tungsten wire to make electrical contact, a thin layer of gold followed by a thicker layer of indium was plated on. Gold wires (0.001-in. diam) were indium soldered to the plated regions. These contacts were able to withstand the temperature and pressure cycling involved in the experiments.

Measurements

The samples were mounted in a Be-Cu pressure bomb (1.43-cm o.d., 0.32-cm i.d.), which, when pumped to the desired He-gas pressure (0–9 kbar), could be lowered into a Dewar. The Hall and resistivity voltages were displayed on an xy recorder as a function of magnetic field. (The sample mounting and pressure techniques have been described in more detail in Ref. 22.)

For the 4.2 °K measurements the bomb was slowly lowered into the Dewar, so that the pressurized helium solidified from the bottom up. There may be some uncertainty about the final pressure in the bomb. For example, helium at 8 kbar solidifies at 55 °K.[23,24] If it then cools to 4.2 °K at constant volume, the pressure would drop by about 8%. Most of this drop, however, occurs in the first 15 °K of cooling. Differences in temperature between the two ends of the bomb cavity (length 10 cm) during the cooling are expected to be higher than 15 °K. Therefore, assuming that within the bomb cavity solid helium cannot support a pressure gradient,[24,25] a large portion of the pressurized helium in the bomb cools through the first 15 °K after solidification at constant pressure. When the helium in the 0.050-cm-i.d. pressure tubing, which is connected to the top of the bomb, finally solidifies, the bomb becomes effectively sealed and the rest of the cooling takes place at constant volume. In the following we assume that the pressure in the bomb at 4.2 °K is the externally maintained pressure. In view of the above considerations, this is thought to be closer to fact than the assumption of cooling at constant volume.[25]

RESULTS AND PRELIMINARY ANALYSIS

Figures 1 and 2 show the zero-field resistivity and low-field Hall coefficient as a function of pressure for the three samples at 4.2 °K. A clear transition is indicated by the sharp rise in resistivity and the sudden change of sign of the Hall coefficient, which results from the removal of the minority electrons. For samples 7B and 7B1 the transition occurs between 3 and 4 kbar, and for sample 8B between 7 and 8 kbar. In sample 7B (annealed sample), the resistivity increases by more than three orders of magnitude, indicating that only a small fraction of the conductivity at atmospheric pressure is due to holes.

In order to obtain the concentrations and mobil-