MEASUREMENT OF CARRIER MOBILITY IN LIQUID HYDROGEN

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We used a three-electrode time-of-flight procedure [1] to measure the mobility of charges in liquid hydrogen between 14 and 21°K.

Figure 1 shows the instrument used by us. The hydrogen passed first through a carbon trap 2 and a Petryanov filter 3, and was condensed in glass ampoule 1. The ampoule temperature was varied by displacing it relative to the level of the liquid helium, and was measured with carbon thermometer 4. The construction of the measuring cell and the measurement circuit are described in [1].

The distance from the source to the grid was 120 μ, the drift space was 560 μ. The measurements were made at a field intensity of 2300 V/cm.

Figure 2 shows the observed frequency dependence of the collector current. The mobilities of the positive and negative carriers are listed in the table.

	$T°$, K	μ, $cm^2/sec\text{-}V$
+	19.4	$1.0 \cdot 10^{-2}$
−	14.0	$1.2 \cdot 10^{-2}$
−	21.4	$1.6 \cdot 10^{-2}$

[1] Ag-Ge films prepared by us by the same method revealed no superconductivity down to 1.2°K.

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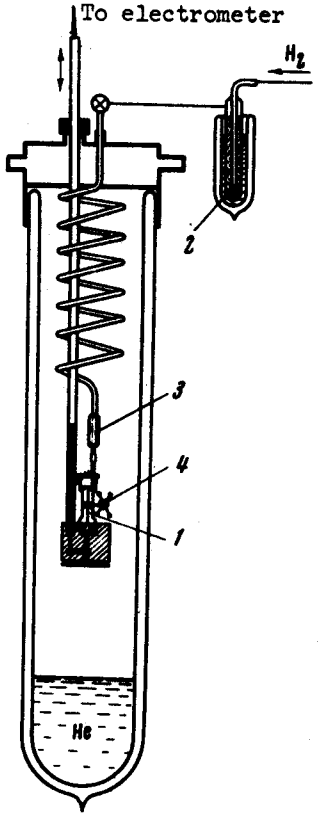

Fig. 1

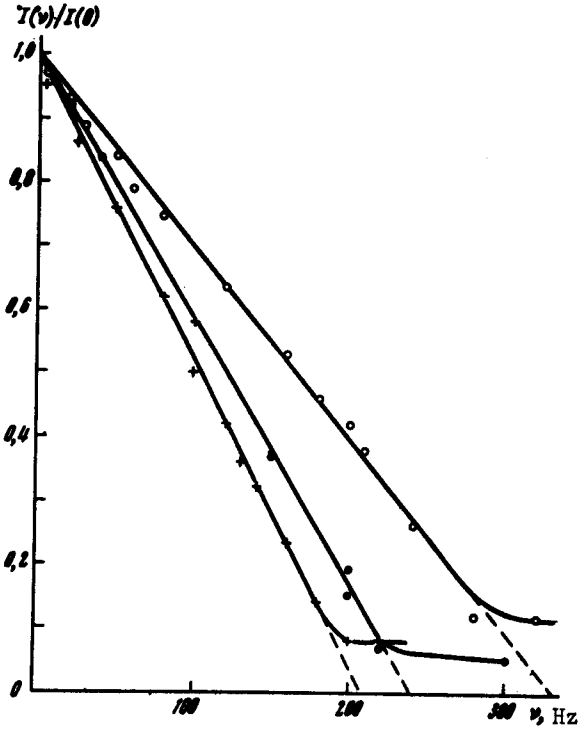

Fig. 2. Current vs. frequency for positive carriers (+ - T = 19.4°K) and negative carriers (● - T = 14°K, o - T = 21.4°K).

From the character of the function I = f(ν) it follows that in the main (∿90%) the induced conductivity at low field intensities is due to carriers of this type.

An attempt to measure the carrier mobility in a hydrogen crystal grown in this instrument was unsuccessful, apparently for reasons indicated in [1] (the current decreased by a factor of more than 100 upon solidification).

[1] K. Keshishev, L. Mezhov-Deglin, and A. Shal'nikov, this issue, next article.