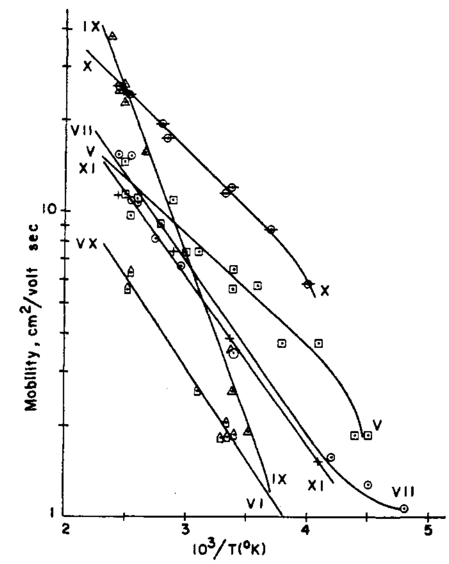

Fig. 1—Temperature dependence of Hall mobility μ_H for CdS films.

TABLE I

Sample	Resistivity (Ω cm) (300 K)	Hall Mobility (cm^2/V sec) (300 K)	E_R (eV)	E_μ (eV)	E_ρ (eV)	Source T (°C)	Substrate T (°C)	Processing	Color
5	32	6	0.13	0.07	0.21	—	23	360°C H_2 bake	yellow
6	6	2	0.06	0.12	0.18	—	23	None	black
7	24	4.4	0.07	0.12	0.18	880	100	None	orange
8	10,000	—	—	—	0.32	820	200	None	yel-or.
9	270	3.2	0.05	0.20	0.25	750	200	None	yel-or.
10	1900	12	0.35	0.07	0.42	760	140	None	yel-or.
11	650	4	0.12	0.10	0.22	730	160	None	yel-or.

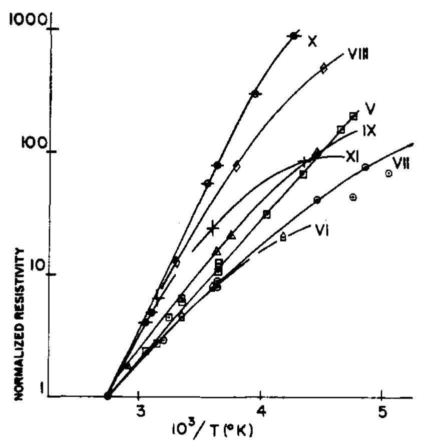

Fig. 2—Temperature dependence of the resistivity ρ of CdS films. The ordinate is normalized at 400°K.

of the reciprocal of the free-charge density, the sum of the activation energies for the mobility and the Hall coefficient should equal the activation energy of the resistivity, as is observed.

Discussion

The observation of an exponential dependence for Hall mobility on temperature in deposited CdS films was first reported by Berger.[3] Such a dependence has also been found in deposited films of PbS, and, following the analysis of Petritz,[4] it is often ascribed

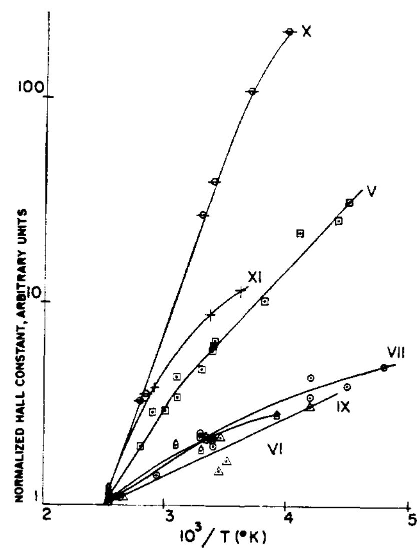

Fig. 3—Temperature dependence of the Hall constant R_H for deposited CdS films. The ordinate is normalized at 400°K.

to scattering at the boundaries between the small crystallites which make up the film. There is reason to doubt this hypothesis chiefly because of the near independence of the observed Hall-mobility value on crystallite size. This view is corroborated by Berger.[3] Work is now going on in this laboratory to ascertain whether or not the observed mobility dependence is not resultant from the large deep-trap densities that are known to characterize these films. This information is being sought through photo-Hall effect measurements, and through thermally-stimulated trap emptying studies. Present technology in this effort permits the fabrication of films with significantly higher mobilities and resistivities than those discussed in this communication.

R. S. Muller
B. G. Watkins
Elec. Engrg. Dept.
University of California
Berkeley, Calif.

[3] H. Berger, "Über das Ausheilen von Gitterfehlern frischaufgedampfter CdS-Schichten (I)," *Phys. Status Solidi*, vol. 1, pp. 739–757; July, 1961.

[4] R. L. Petritz, "Theory of photoconductivity in semiconductor films," *Phys. Rev.*, vol. 104, pp. 1508–1516; December, 1956.

Correction to "Relationships between Different Kinds of Network Parameters, Not Assuming Reciprocity or Equality of the Waveguide or Transmission Line Characteristics Impedances"[1]

The following has been called to the attention of the Editor. In the relationship having the S-matrix on the left and expressions involving A, B, C, D, Z_{01} and Z_{02} on the right, a plus sign should appear in the denominator between the terms $(B+CZ_{01}Z_{02})$ and $(AZ_{02}+DZ_{01})$.

R. W. Beatty
D. M. Kearns
National Bureau of Standards
Boulder, Colo.

Manuscript received February 11, 1964.

[1] R. W. Beatty and D. M. Kearns, Proc. IEEE (*Correspondence*), vol. 52, p. 84; January, 1964.

Considerations Regarding the Use of Semiconductor Heterojunctions for Laser Operation

In a recent communication,[1] Kroemer has proposed a new injection scheme using heterojunctions for possible laser action, in which an indirect-gap semiconductor, say Ge, is sandwiched between two direct-gap semiconductors of opposite types, say n- and p-type GaAs. In our laboratory, we also have considered the feasibility of using heterojunctions for laser work based on a different scheme. Kroemer's proposal presupposes that 1) injected electrons and holes would be trapped in the center region by potential barriers at the two heterojunctions and 2) laser action would eventually occur at sufficiently high carrier injection levels. The argument presented in his communication, however, is rather vague and misleading. We would like to discuss theoretical considerations in using heterojunctions for laser operation and to present our scheme in view of these considerations.

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[1] H. Kroemer, "A proposed class of heterojunction injection lasers," Proc. IEEE (*Correspondence*), vol. 51, pp. 1782–1783; December, 1963.