Since the Se^{79} is still unknown, Mr. William Low searched for a line due to OCSe^{79}, using a recording Stark modulation spectrometer and with the OCSe gas at dry ice temperatures. If the Se^{79} occurred naturally, it should produce a line very near that due to the OCSe^{80}, $v_2=2$, $l=0$ transition. No absorption attributable to Se^{79} was found, however, and since the nearby OCSe, $v_2=2$, $l=0$ line strength was about seven times noise background (at $-78°\mathrm{C}$), an upper limit of one part in 10,000 may be set on the natural abundance of Se^{79}.

The design of the heterodyne spectrometer has benefited from the advice of Professor Yardley Beers. In addition, the authors appreciate the considerable help of Mr. R. H. Ellis, Jr. in construction of the spectrometer, and the interest of Mr. Paul Kisliuk who some time ago initiated work on these measurements but was not able to carry them through with the equipment then available.

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Resonance and Thermal Neutron Scattering in V^{51}

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A LITERAL application of the Breit-Wigner scattering theory enables one to correlate the experimental values of the resonance and thermal cross sections of V^{51}

Harris, Hibdon, and Muehlhause[1] have reported a prominent neutron scattering resonance ($\Gamma_n \gg \Gamma_\gamma$) in V^{51} at ~2700 ev with a scattering resonance integral, Σ_s, of 192*b*. This quantity yields the coherent thermal scattering amplitude, *a*, via the following relations:

$$a=g(\lambda_0\Gamma_n/2E_0),\quad \Sigma_s=\tfrac{1}{2}\pi g\sigma_0\Gamma_n/E_0,$$

and

$$\sigma_0=4\pi\lambda_0^2=2.60\times10^6/E_0,$$

where λ_0 = neutron wave-length at the resonance energy, Γ_n = neutron width, E_0 = resonance energy, and $g=\frac{1}{2}(1\pm1/2i+1)$ is the statistical weight factor ($i=7/2$, spin of V^{51}). These relations yield the formula

$$a=\lambda_0\Sigma_s/\pi\sigma_0=0.555b^{\frac{1}{2}}\ (\text{units of }10^{-12}\text{ cm}).$$

Shull and Wollan[2] have reported the coherent thermal scattering cross section, σ_{coh}, to be less than 0.1*b* (units of 10^{-24} cm²). This quantity, according to the one-level Breit-Wigner formula, is given by:

$$\sigma_{\mathrm{coh}}=4\pi|R-(g\lambda_0\Gamma_n/2E_0)|^2=4\pi|R-a|^2;$$

where $R=0.137A^{\frac{1}{3}}$ is the nuclear radius. For V^{51} we have $R=0.508b^{\frac{1}{2}}$ and therefore:

$$\sigma_{\mathrm{coh}}=4\pi|0.508-0.555|^2\simeq0.03b\ (\text{negative phase}).$$

The resonance data are also in good agreement with the total thermal scattering cross section, σ_s, given by Hibdon[3] as 5.02*b*. This quantity can be used to determine the total angular momentum, *J*, of the compound state at 2700 ev. Again the one-level Breit-Wigner expression for σ_s yields:

$$\sigma_s=4\pi g|R-(a/g)|^2+4\pi(1-g)R^2,$$

from which

$$\sigma_s=5.02b\ (g=7/16\text{ for }J=3),$$

or

$$\sigma_s=3.04b\ (g=9/16\text{ for }J=4).$$

Preference is therefore indicated for $J=3$. One may also conclude that

$$\sigma_{\max}\simeq420b\quad\text{and}\quad\Gamma\simeq780\text{ ev}.$$

Since one resonance level determines the thermal scattering cross section so completely it appears that the next closest level, ϵ_2, from zero energy is such that $|\epsilon_2|\gg2700$ ev. Other cases of light odd-*Z*, even-*n*, isotopes which display this same level pattern are:[4-6] Na, Cl, Co, and Mn.

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Observations of the Rapid Withdrawal of Stored Holes from Germanium Transistors and Varistors

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IN the course of a study of transistor response to square pulses of applied voltage and current, the behavior illustrated in Fig. 1 was found to be typical of units employing *N*-type germanium. The collector current I_c is there shown as a function of time for different pulsed values of I_ϵ (emitter current) and V_c (collector voltage), applied as independent parameters. For each of the curves except the ones marked "steady state," V_c was pulsed from zero to 10 volts in the "reverse" direction (for which the point contact normally has a high resistance) for a period of one microsecond.

The bursts of collector current provoked by preceding emitter current appeared to be explainable most reasonably on the basis of a rapid gathering-in of holes[1] produced by the forward emitter current and existing within the germanium at the time of application of collector potential. This explanation suggested that the same electrode might be used first to inject holes as an emitter and then to withdraw them as a collector. When this was tried, bursts of reverse current exceeding 24 milliamperes and overloading the pulser were obtained for the same voltage pulses, which interrupted a normal forward current of only 1 milliampere. With the forward current reduced to zero, the reverse current pulses became square and only a fraction of a milliampere in height.

Using a more powerful pulse generator for examining conventional germanium varistors (diodes) of various types, we found that the response curves could be classified into several dis-

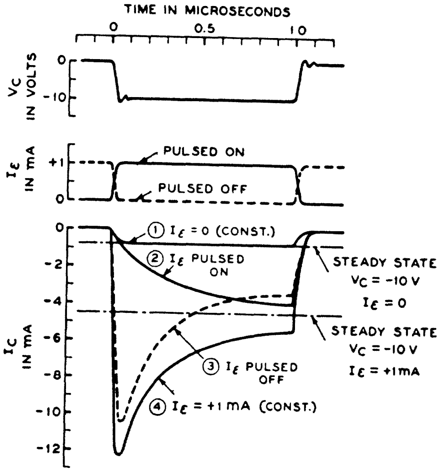

FIG. 1. Pulse study of transistors—typical wave forms.