TABLE II. Shock wave data for carbon disulfide.

	Initial density (g/cc)	Shock velocity (km/sec)	Particle velocity (km/sec)	Pressure (kbar)	Relative volume (V/V_0)	Dural shock velocity (km/sec)	
-	1.260	2.47±0.01	0.75±0.08	23±3	0.698±0.033	5.93±0.07	-
	1.249	2.41 ± 0.00	0.86 ± 0.04	26±1.	0.642 ± 0.017	6.02 ± 0.03	
	1.251	2.59 ± 0.01	0.86 ± 0.05	28±2	0.668 ± 0.017	6.02 ± 0.04	
	1.251	2.94 ± 0.01	1.01 ± 0.03	37±1	0.658 ± 0.010	6.16 ± 0.02	
	1.257	3.06 ± 0.01	1.07 ± 0.03	41±1	0.650 ± 0.010	6.22 ± 0.03	
	1.263	3.09 ± 0.01	1.08 ± 0.04	42±2	0.651 ± 0.012	6.23 ± 0.03	
	1.264	3.39 ± 0.01	1.31 ± 0.03	56±1	0.615 ± 0.008	6.43 ± 0.02	
	1.245	3.43 ± 0.01	1.39 ± 0.02	59±1	0.594 ± 0.006	6.50 ± 0.02	
	1.272	3.47 ± 0.01	1.40 ± 0.03	62±1	0.597 ± 0.008	6.52 ± 0.02	
	1.260	3.47 ± 0.01	1.42 ± 0.02	62±1	0.590 ± 0.007	6.54 ± 0.02	
	1.266	3.51 ± 0.01	1.52 ± 0.08	68±4	0.566 ± 0.024	6.62 ± 0.07	
	1.249	3.53 ± 0.01	1.72 ± 0.02	76±1	0.513 ± 0.007	6.78 ± 0.02	
	1.249	3.55 ± 0.01	1.81 ± 0.01	80±1	0.491 ± 0.004	6.86 ± 0.01	
	1.272	3.65 ± 0.01	1.87 ± 0.05	87±2	0.489 ± 0.013	6.92 ± 0.04	
	1.253	3.62 ± 0.01	1.91 ± 0.02	87±1	0.473 ± 0.006	6.95 ± 0.02	
	1.251	3.78 ± 0.01	2.13 ± 0.09	101±5	0.436 ± 0.025	7.14 ± 0.08	
	1.251	4.02 ± 0.01	2.25 ± 0.02	113±1	0.442 ± 0.004	7.26 ± 0.01	
	1.257	4.18 ± 0.00	2.28 ± 0.02	120±1	0.454 ± 0.004	7.31 ± 0.02	
	1.264	4.20 ± 0.01	2.33 ± 0.04	124 ± 2	0.446 ± 0.009	7.35 ± 0.03	
	1.248	4.40 ± 0.01	2.56 ± 0.03	141 ± 2	0.420 ± 0.007	7.56 ± 0.03	
	1.275	4.86 ± 0.02	2.77 ± 0.03	172 ± 2	0.430 ± 0.006	7.80 ± 0.03	
	1.253	4.80 ± 0.01	2.83 ± 0.02	170 ± 1	0.410 ± 0.005	7.83 ± 0.02	
	1.258	5.23 ± 0.02	3.20 ± 0.08	211±5	0.388 ± 0.015	8.20 ± 0.06	
	1.251	5.20 ± 0.02	3.31 ± 0.06	215 ± 4	0.364 ± 0.011	8.29 ± 0.05	
	1.251	5.68 ± 0.03	3.48 ± 0.03	247 ± 2	0.388 ± 0.006	8.48 ± 0.03	
	1.255	6.04 ± 0.03	3.72 ± 0.09	282 ± 7	0.384 ± 0.015	8.74 ± 0.08	
	1.266	6.46 ± 0.02	3.92 ± 0.04	320 ± 4	0.396 ± 0.007	8.97 ± 0.04	
	1.254	6.36 ± 0.02	3.98 ± 0.07	317±6	0.375 ± 0.011	9.00 ± 0.06	
	1,253	6.44 ± 0.04	4.06 ± 0.09	328 ± 7	0.371 ± 0.014	9.08 ± 0.08	
	1.257	6.73 ± 0.03	4.37 ± 0.06	370 ± 5	0.351 ± 0.010	9.39 ± 0.05	
	1.258	7.34 ± 0.04	4.71 ± 0.07	435 ± 6	0.358 ± 0.010	9.77 ± 0.06	
	1.258	7.64 ± 0.05	4.93 ± 0.07	473 ± 7	0.355 ± 0.010	10.00 ± 0.06	
	1.266	7.84 ± 0.03	5.09 ± 0.14	504 ± 14	0.350 ± 0.018	10.17 ± 0.12	
	1.253	7.98 ± 0.08	5.09 ± 0.12	509 ± 12	0.363 ± 0.017	10.18 ± 0.10	
	1.255	8.09 ± 0.05	5.18 ± 0.11	526 ± 11	0.360 ± 0.014	10.28 ± 0.09	

Included on the graph is the measured sound speed¹⁹ of the liquid benzene at 22°C and local atmospheric pressure. In Fig. 5 the $P-V/V_0$ data are plotted along with the curves transformed from the fit of the U_s-U_p data. The initial density was 0.879 g/cc.

The U_s-U_p and $P-V/V_0$ plots indicate that a transition begins at about $U_s=5.80$ and $U_p=2.60$ km/sec, and a pressure of 133 kbar, and ends at about $U_s=6.30$, $U_p=3.50$, and a pressure of 194 kbar. It is possible that a transition occurs below 5 kbar since the lowest line segment extrapolates to a value on the U_s axis 14% higher than the measured sound speed. The $P-V/V_0$ data of Fig. 5 are represented by concave upward curves below 133 kbar and above 194 kbar, with a third curve fitted to the few points in between. If the upper Hugoniot curve is extrapolated to 133 kbar and the lower Hugoniot curve is used as a reference, the change in V/V_0 due to the transition is about 16%.

In many solids the occurrence of a normal instantaneous (less than 0.1 µsec) transition is represented in the $U_{\bullet}-U_{\mu}$ plane by either a change in slope or by an interval of constant shock velocity. The latter case is usually accompanied by a double shock wave structure. The benzene $U_s - U_p$ plot appears to contain a combination of both characteristics since the shock velocity increases very slowly with particle velocity over the small interval described in Eq. (8). However, the formation of a double shock structure is not expected because the Rayleigh line from the foot of the $P-V/V_0$ curve connects all points on the Hugoniot in a single shock process. This conclusion was verified by the performance of some double shock wave experiments as explained in Sec. II. Based on the above observations and a knowledge of other materials, 18,20 benzene is believed to undergo an instantaneous transition for two reasons: (1) a sluggish (greater than 1 µsec) transition is unlikely because a plot of the $U_{\bullet}-U_{p}$ data shows a