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 speed[19] 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_s-U_p 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_s-U_p data shows a