Hugoniot Equation of State of Polymers

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PREFACE

This report was put together in 1977 but for several reasons has not been made readily accessible. The data was published in the LASL Shock-Data book in 1980 edited by S. Marsh. However, the data regarding the Hugoniot cusps and Carter and Marsh's ideas concerning the reason for the cusps have not been available. We have taken it upon ourselves to make an LA-series report as it would have appeared in 1977 so the data and ideas expressed by the authors can appear in a coherent form. Although other shock work has been done on polymers since then, no definitive information regarding the real time chemistry is yet available, hence these authors' ideas deserve a modern consideration.—J. N. Fritz and S. Sheffield.

HUGONIOT EQUATION OF STATE OF POLYMERS

by

William J. Carter and Stanley P. Marsh

ABSTRACT

The Hugoniot equations of state of a large number of representative polymers have been obtained. Two aspects of the results are particularly striking:

a) The $u_s(u_p)$ Hugoniots of all the polymers extrapolate to bulk sound velocities higher than the ultrasonic values, an indication of a rapidly varying rate of change of compressibility in this region. This is attributed both to the two-dimensional nature of polymer compression and to the form of the interchain interaction potential.

b) A relatively high pressure transformation (in the range 20–30 GPa), characterized by a change in slope of the $u_s(u_p)$ Hugoniot and sometime by a large volume change as well, is observed for all of the polymers. This transformation is probably associated with pressure-induced cross bonding. In particular, for those polymers which contain rings in their monomer structure and which display the largest volume change at transformation, it is proposed that carbon-carbon covalent bonds along chains are broken and tetragonal bonds between chains are formed in a manner analogous to the graphite-diamond transformation.

I. INTRODUCTION

Although polymers are widely used in engineering applications involving high pressure, there exist remarkably little data on their compressive behavior above a few GPa. There are some static data available in the range 0–2 GPa for a few materials¹, and considerable shock-wave data have been amassed for materials such as polyethylene and polymethylmethacrylate² and epoxy³. There have been phase changes reported in a few polymers in the low-pressure range, notably the spiral transformation in Teflon at about one half GPa, which have been thoroughly studied using x-ray diffraction^{4, 5}. However, the general lack of dynamic high-pressure data has prompted the present study. The polymeric solids studied (which include both thermosetting and thermoplastic types) are listed in Table I along with pertinent thermophysical properties at zero pressure. Most of these materials were fabricated by Group CMB-6 of Los Alamos under conditions which are both known and reproducible. An exception was the polyphenylquinoxaline, an experimental, highly aromatic polymer which was kindly supplied by the United States Naval Ordnance Laboratory⁶. A few other materials were obtained in bulk solid-form from commercial sources.

II. EXPERIMENTAL PROCEDURE

Standard shock-wave techniques³, which utilize high explosives to generate the shocks and streak cameras to record the wave-arrival times, were used to obtain shock-wave velocities, u_s , through the samples. The impedance-match technique then sufficed to determine the associated material velocities, u_p . The well-known Rankine-Hugoniot relationships between these experimentally determined kinematic quantities and the pressure P , volume V , and energy E then determine the equation of state along the locus of final shock states, or the Hugoniot. Although energy is known along these curves, the temperature can only be crudely established because the volume dependence of the specific heat and the Grüneisen parameter for polymers is not well known⁷. Hence, quantitative thermodynamic calculations are of dubious value. In particular, no attempt was made to calculate off-Hugoniot loci, such as isotherms. Our compression curves include temperature effects and therefore will lie above those determined by static means, especially in the higher pressure regions.

Sound velocities at zero pressure were obtained using a pulse-echo technique which has also been previously described³. Both longitudinal (c_l) and transverse (c_t) modes were measured and combined to form the "bulk sound speed" c_b through the relation $c_b^2 = c_l^2 - (4/3)c_t^2$. This may not be appropriate for materials which have a high enough crystallinity to be non-isotropic on a macroscopic scale. However, even for linear polyethylene, rotation of the sample in its holder resulted in no noticeable anisotropy. Shear-mode echoes were sometimes difficult to detect so that first-arrival times through samples of varying thickness were used when necessary. These velocities are listed in Table I.

III. RESULTS AND DISCUSSION

The Hugoniot curves are reasonably well defined for each of the polymers considered here, and the results are summarized and listed in Table I. Here, the data have been fitted to segmented lines of the form $u_s = c_0 + su_p$ by the method of least squares, with the range of validity of each fit given by minimum and maximum values of u_p . Listed also are the transition pressures and compressions (discussed below) and an estimate of the associated volume change at transition. A detailed listing of the data points is given in the appendix. Figure 1 shows a typical Hugoniot of a

Figure 1: Hugoniot $u_s(u_p)$ (a) and $P(V/V_0)$ (b) data for polystyrene. The Hugoniot for this material is typical for most of the remaining polymers both in number of data points and quality of data as indicated by scatter from a linear fit. It also shows the two characteristics found for all polymers: a sound velocity that lies well below the Hugoniot intercept and a well-defined but pressure-dependent transformation which begins at 20 GPa.

polymer (polystyrene) in both the u_s - u_p and P - V planes, and illustrates two of the features which are prominent in the Hugoniot of most of the remaining materials. These features warrant further discussion and will be considered in detail.

The first such feature common to all the polymer Hugoniot is the failure of the high-pressure data to extrapolate to the zero-pressure ultrasonic measurements. This is also strikingly evident in a comparison between c_b , the ultrasonic sound speed, and the corresponding values of c_{0a} , the zero-pressure intercept of the lower segment of the Hugoniot, from Table I. Ordinarily, this behavior is an indication either of a low-pressure phase change or of a high shear-strength which does not allow the one-dimensional Hugoniot to relax to the hydrostat in times short compared to the measurement interval. With a few exceptions, the static data do not show any phase

Table I. Equation of State Properties of Polymers

Material	Properties at Zero Pressure				Summary of Hugoniot Results						Transformation Parameters				
	ρ_0 (g/cm ³)	c_t (km/s)	c_l (km/s)	c_b (km/s)	c_{0a} (km/s)	s_a	u_{prange} (km/s)	c_{0b} (km/s)	s_b	u_{prange} (km/s)	P_t (GPa)	$(V/V_0)_t$	V_t (cm ³ /g)	$(\Delta V/V)_t$ (%)	$(P\Delta V)_t$ (J/mg)
Polyethylene															
linear	0.954	2.462	1.014	2.166	2.86	1.57	0.7-3.2	3.27	1.43	3.4-5.3	24.7	.592	.0027	0.4	0.066
branched	0.916	2.043	0.659	1.896	2.61	1.63	0.7-2.9	3.17	1.41	3.0-4.8	19.5	.605	.0054	0.8	0.106
Polyvinyl chloride	1.376	2.296	1.080	1.928	2.33	1.50	0.7-2.6	2.34	1.46	2.7-4.9	22.3	.583	.0061	1.4	0.136
Polyvinylidene fluoride	1.767	2.097	0.850	1.853	2.58	1.58	0.6-2.6	2.98	1.39	2.8-4.6	31.7	.609	.0042	1.2	0.134
Polychlorotrifluoroethylene	2.133	1.744	0.769	1.501	2.05	1.66	0.6-2.9	2.51	1.51	3.0-4.1	43.7	.575	-	-	-
Polytetrafluoroethylene	2.151	1.230	0.406	1.139	1.68	1.79	0.6-2.8	2.08	1.62	2.9-3.7	41.6	.580	.0029	1.1	0.123
Polypropylene	0.904	2.583	1.256	2.137	2.86	1.49	0.7-3.2	3.22	1.38	3.2-5.4	21.5	.583	-	-	-
Poly-(4-methyl-1-pentene)	0.830	2.193	1.077	1.806	2.07	1.59	0.5-3.0	2.42	1.46	3.1-5.5	17.2	.561	.0041	0.6	0.070
Polyamide	1.140	2.535	1.078	2.208	2.67	1.69	0.8-2.6	3.89	1.18	2.8-5.2	20.8	.633	.0060	1.1	0.126
Polymethylmethacrylate	1.186	2.688	1.304	2.227	2.59	1.52	0.3-2.9	2.90	1.33	3.4-5.3	26.2	.578	.0166	3.4	0.433
Polystyrene	1.046	2.306	1.144	1.890	2.34	1.58	0.7-2.8	1.92	1.43	3.9-5.4	19.8	.587	.0684	12.2	1.356
Cellulose Acetate	1.255	2.450	1.153	2.057	2.29	1.55	0.6-2.6	2.27	1.41	3.2-5.2	20.7	.589	.0274	5.9	0.568
Epoxy	1.192	2.641	1.177	2.264	2.69	1.51	0.4-2.8	2.88	1.35	3.6-5.2	23.1	.597	.0197	3.9	0.454
Phenolic	1.385	3.058	1.594	2.442	2.98	1.39	0.6-2.6	2.05	1.55	3.0-5.0	23.2	.609	.0296	6.7	0.687
Phenoxy	1.178	2.506	1.069	2.173	2.63	1.54	0.6-2.6	2.46	1.40	3.6-5.2	21.7	.602	.0373	7.3	0.808
Polycarbonate	1.196	2.187	0.886	1.933	2.33	1.57	0.4-2.6	2.06	1.39	3.6-5.2	20.0	.593	.0566	11.4	1.131
Polyester	1.217	2.528	1.262	2.066	2.57	1.49	0.7-2.6	2.16	1.41	3.4-5.1	20.3	.596	.0434	8.8	0.879
Polyimide	1.414	2.723	1.217	2.332	2.66	1.48	0.6-2.2	0.93	1.64	3.4-4.6	17.8	.633	.0908	20.3	1.615
Polyphenylquinoxaline (NOL)															
non-cross-linked	1.206	2.703	1.269	2.271	2.46	1.48	0.7-2.2	1.72	1.44	3.5-5.3	15.7	.612	.0672	13.3	1.058
35% cross-linked	1.206	2.457	1.158	2.061	2.46	1.48	0.7-2.5	1.72	1.44	3.5-5.3	18.0	.598	.0657	13.3	1.183
Polysulfone	1.235	2.249	0.930	1.976	2.35	1.55	0.7-2.4	1.58	1.51	3.4-5.1	18.5	.603	.0628	12.9	1.160
Polyurethane	1.265	2.390	1.030	2.068	2.54	1.57	0.6-2.6	2.25	1.47	3.6-5.1	21.7	.607	.0353	7.3	0.768

changes in this low-pressure region. It is known that some polymers become quite brittle upon impact, but capacitor and magnetic probe free-surface records show that the Hugoniot elastic limit of polymers is immeasurably small. Early dynamic experiments by Evans and Schmidt⁸ on polymethylmethacrylate also showed considerable curvature at the low-pressure end of the u_s - u_p locus and it was surmised that this effect would appear in other polymers as well. Considerable theoretical progress has been made in understanding this behavior, at least for the simple case of polyethylene, by Pastine^{9, 10}. His development depends on the fact that the forces between adjacent chains in a polymer are at least an order of magnitude smaller than the forces along the backbone¹¹. Hence, the initial compression, assuming hydrostaticity, will be of a two-dimensional rather than a three-dimensional nature on a microscope scale, with the distance between chains decreasing but length along the backbone remaining relatively unaffected. That is, to obtain the initial compressibility of a polymer it suffices to specify only the interchain forces (and, of course, the geometrical arrangements). For polyethylene, and probably for most polymers as well, the dominant repulsive forces are those between non-bonded nearest-neighbor hydrogens and the dominant attractive forces are of the London dispersion (van der Waals) types. That is, the potential is of the general form¹²

$$\phi = Ae^{-r/r_0} - B/r^6 \quad (1)$$

where r is the nearest-neighbor hydrogen distance and the individual potentials must be summed in a manner appropriate for the crystal structure. It is assumed by Pastine that this relation holds for amorphous polyethylene as well, except that the exponential term takes a slightly different form. Straightforward calculation of the pressure from this potential, assuming that the polymer is compressible in two dimensions only, then yields a $P(V)$ relation which shows considerable curvature when transformed to the u_s - u_p plane. Similar low-pressure behavior can be expected for all polymers provided only that the dominant forces determining initial compression are those between non-bonded hydrogens in neighboring chains.

Experimental quantitative verification of these ideas is found in the Hugoniot data for polyethylene. We have examined two densities of polyethylene representing degrees of crystallinity of approximately 90% and 55%. The low-pressure Hugoniot data are shown in Fig. 2, along with the theoretical Hugoniots derived for these densities from the purely crystalline and purely amorphous calculations of Pastine. The agreement is seen to be excellent. Also shown are the static data of Warfield¹ for the highly crystalline material, corrected from an isothermal to an isentropic intercept but with no shock heating included, and Bridgeman's uncorrected data¹³ on normal density polyethylene. These data lie in precisely the region of curvature of most interest, and again the agreement with theory is quite good. It is tempting to extend these ideas, at least qualitatively, to account for the curvature in the lower part of the $u_s(u_p)$ Hugoniots of other polymers. This is probably justified in general. However, it should be remembered that low-pressure phase changes do occur in a few polymers. There also are alternative theories which would yield equivalent results; for example, the elastic-plastic flow model proposed by Schmidt and Evans⁸, in which yielding oc-

Figure 2: Low-pressure data for polyethylene. The lines (solid and dashed) are the theoretical calculations based on the work of Pastine, while the symbols are either dynamic data or static data transformed to the u_s - u_p plane through the conservation relations. The agreement between theory and the various experimental data is excellent.

curs in a complex manner over a range of stresses and cannot be assigned a definite value, also predicts extreme curvature at low particle velocities. These possibilities should be further explored, but will probably require use of more sophisticated experimental shock-wave diagnostic techniques than have been used here.

A high-pressure (20–30 GPa), high-temperature (2000 K) phase transformation is the second feature common to all the polymers with the possible exception of two of the fluoroplastics. For many materials the associated volume change is extremely large. Clearly, this is not a polymorphic transformation in the usual crystallographic sense, in that the transformation parameters appear to be insensitive to the degree of crystallinity (polystyrene, for example, is completely amorphous). Since similar behavior is observed on both thermosetting plastics and thermoplastics, the possibility of the transformation being associated with either melting or vaporization appears to be ruled out. Furthermore, it is unlikely that the glass-transition phase line extends to this region of pressure

and temperature, and our calculations support this expectation. Also, at least at low pressures, the glass transition is not normally accompanied by a measurable volume change and there is little reason to expect this situation to change at higher pressures.

The most likely explanation of the nature of this transformation lies in an extension of the ideas already encountered at low pressures. At zero pressure, the elastic constants of polyethylene are known¹⁰ and C_{33} (which defines compression along the backbone chain) is found to be at least a factor of 20 greater than the elastic constants associated with the other two crystal axes. However, this situation obviously cannot continue long before forces between chains other than the H-H repulsion and van der Waals attraction come into play to stiffen the elastic constants C_{11} and C_{22} , eventually making them comparable in magnitude to C_{33} . This implies that at sufficiently high pressures, the compressive behavior of polymers is similar to other normal three-dimensional solids, a fact which is reflected by the linear portion of the Hugoniot below the transition. At the transformation a major reordering on the molecular level is suggested since the volume changes for some polymers can evidently be quite large for this process. A possible type of such reordering is the following: when the distance between chains has been reduced by pressure to the point that interchain interactions become possible. This effect would be most pronounced in those polymers containing covalent-bonded carbon atoms in open structures such as benzene rings, since the breaking of covalent bonds within chains and subsequent reformation of tetravalent bonds between chains could lead to very large volume changes. Of course the concept of a chain-like structure in polymers loses meaning after this point, and one is dealing with a more normal solid above the transition consisting of an unspecified but definite array of the original constituent atoms.

These ideas are strengthened by the results shown in Table I. Here, an attempt has been made to estimate the volume contraction at transition for each of the polymers by measuring ΔV_t on the Hugoniot in the P - V plane and ignoring such important thermodynamic details as the slope of the phase line and temperature effects. The enthalpy change ΔH_t at transition is similarly estimated as $(P\Delta V)_t$. Representative monomer structures for each of our polymers are shown schematically in Table II, and it is clear that there is a strong correlation between ΔH_t per unit volume from Table I and the number of benzene rings which are available for decomposition from Table II. This is further indicated in Fig. 3, where the $u_s(u_p)$ Hugoniots for five selected polymers are shown along with their representative monomer structures. Clearly, the transition becomes increasingly pronounced as the number of benzene rings in the backbone chain increases. The linear hydrocarbons and fluorocarbons, represented in Fig. 3 by polyethylene, display little more than a change in slope in the transition. Extremely open structures such as polysulfone and polyimide have transitions characterized by large volume changes. Polymers such as polystyrene also exhibit large volume changes, but the single ring in a styrene monomer is contained in a pendant chain and is therefore physically closer to the neighboring backbone fibers. In every case, the mixed-phase region of the $u_s(u_p)$ Hugoniot also displays a slightly positive slope which is probably indicative of a pressure-energy dependent transformation such as would be expected if our model is correct.

Table II: Representative Idealized Monomer Structures.

polyethylene

polyvinyl chloride

polyvinylidene fluoride

polychlorotrifluoroethylene

polytetrafluoroethylene

polypropylene

4-methyl-1-pentene-4

polyamide

polymethylmethacrylate

polystyrene

cellulose acetate

epoxy

phenolic

phenoxy

polycarbonate

polyester

polyimide

polyphenylquinoxaline

polysulfone

polyurethane

Figure 3: Hugoniot $u_s(u_p)$ data for several polymers. It is seen from Table II that, in general, those materials having more open units such as benzene rings in their monomer structure also display a more pronounced transition.

The picture which emerges then, is one in which the compression of a polymer under pressure is two-dimensional in nature until the interaction between chains becomes appreciable, after which the material compresses in a manner more typical of a three-dimensional solid. C-C interactions, primarily those between carbons in benzene rings belonging to different chains, gradually become important, eventually overriding the relatively weak covalent bonding of the ring structure, forming strong tetragonal bonds between chains, and effectively destroying the chain-like nature of the polymer in the process. This results in a volume change directly related to the number of such bonds broken and reformed. The process is one which is analogous to the well-known carbon-diamond transformation, which also arises from the breaking of covalent bonds in a ring (lying in a plane rather than along a chain) and the formation of tetragonal bonds (between planes rather than between chains). This carbon-diamond transformation is also accompanied by an extremely

large volume change.

It is very difficult to do quantitative first-principle calculations of the relative energies of these two phases. Although the C-C and C-H bonding energies are well-known at small compressions, these quantities are not known at compressions as large as 0.4. Also, the density of rings subject to decomposition is required, a quantity which is not available for all our polymers. Finally, of course, many of these polymers contain open structures other than benzene rings which are also subject to decomposition and reformation, and the crystallographic arrangements of the final states are entirely unknown. We have attempted to verify or disprove our proposed transformation mechanism by recovering and checking the degree of cross bonding of samples shocked above the transformation pressure in expectation that the high-pressure phase may be metastable, but the recovery process has proved difficult and, so far, unsuccessful. If our model is correct, the high-pressure phase should have unique and possibly quite useful properties.

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APPENDIX. Hugoniot Data for Polymers.

Shock velocities in the unknown (u_s) and in the standard (u_{std}) are the measured quantities from which particle velocities (u_p) are deduced from the continuity conditions. The remaining quantities pressure (P), relative volume (V/V_0), and density (ρ) are obtained from the conservation relations. The integer value in the data tables under std indicates the standard used in the experiment. A 40 indicates a bulk value obtained from ultrasonic data. Data used for the standards in the experimental analysis are given in the following table. Off-Hugoniot EOS information required for calculating cross-curves for the standards is obtained by using the assumption that $\partial E/\partial P)_V = 1/(\rho\gamma)$ is a constant.

EOS Data for Standards

Standard	std	ρ_0 (g/cm ³)	c_0 (km/s)	s	γ_0
2024 Aluminum	1	2.785	5.328	1.338	2.00
921-T Aluminum	2	2.833	5.041	1.420	2.10
Copper	10	8.930	3.940	1.489	1.99

Polyethylene linear (Marlex EMN 6065)

ρ_0 (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_0	ρ (g/cm ³)	std	u_{std} (km/s)
0.954	2.170	0.000	0.0	1.000	0.954	40	0.00
0.954	3.985	0.721	2.7	0.819	1.165	1	5.93
0.954	4.174	0.752	3.0	0.820	1.164	1	5.96
0.954	4.355	0.921	3.8	0.788	1.210	1	6.11
0.954	4.399	0.986	4.1	0.776	1.230	1	6.16
0.954	5.147	1.398	6.9	0.728	1.310	1	6.54
0.954	5.755	1.808	9.9	0.686	1.391	1	6.92
0.954	5.779	1.824	10.1	0.684	1.394	1	6.94
0.954	6.873	2.493	16.3	0.637	1.497	1	7.59
0.954	6.835	2.497	16.3	0.635	1.503	1	7.59
0.954	7.056	2.643	17.8	0.625	1.525	1	7.73
0.954	7.076	2.657	17.9	0.625	1.527	1	7.75
0.954	7.434	2.882	20.4	0.612	1.558	1	7.97
0.954	7.760	3.098	22.9	0.601	1.588	1	8.19
0.954	7.774	3.162	23.5	0.593	1.608	1	8.24
0.954	8.079	3.377	26.0	0.582	1.639	1	8.46
0.954	8.464	3.650	29.5	0.569	1.677	1	8.73
0.954	9.072	4.136	35.8	0.544	1.754	1	9.21
0.954	9.631	4.411	40.5	0.542	1.760	1	9.51
0.954	9.946	4.697	44.6	0.528	1.808	1	9.79
0.954	10.265	4.921	48.2	0.521	1.832	1	10.02
0.954	10.736	5.305	54.3	0.506	1.886	1	10.40
0.954	10.797	5.326	54.9	0.507	1.883	1	10.43

Polyethylene linear (Marlex 50)

ρ_0 (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_0	ρ (g/cm ³)	std	u_{std} (km/s)
0.954	2.130	0.000	0.0	1.000	0.954	40	0.00
0.954	3.968	0.721	2.7	0.818	1.166	1	5.93
0.954	4.131	0.754	3.0	0.818	1.167	1	5.96
0.954	4.332	0.922	3.8	0.787	1.212	1	6.11
0.955	4.361	0.987	4.1	0.774	1.235	1	6.16
0.954	5.157	1.398	6.9	0.729	1.309	1	6.54
0.954	5.764	1.807	9.9	0.686	1.390	1	6.92
0.954	5.734	1.827	10.0	0.681	1.400	1	6.94
0.954	6.862	2.494	16.3	0.637	1.499	1	7.59
0.954	6.753	2.504	16.1	0.629	1.516	1	7.59
0.954	6.939	2.654	17.6	0.618	1.545	1	7.73
0.954	7.061	2.658	17.9	0.624	1.530	1	7.75
0.954	7.371	2.888	20.3	0.608	1.569	1	7.97
0.954	7.751	3.099	22.9	0.600	1.590	1	8.19
0.954	7.788	3.161	23.5	0.594	1.606	1	8.24
0.954	8.056	3.379	26.0	0.581	1.643	1	8.46
0.954	8.493	3.647	29.6	0.571	1.672	1	8.73
0.954	9.657	4.408	40.6	0.544	1.755	1	9.51
0.954	9.978	4.675	44.5	0.531	1.795	1	9.77
0.954	9.980	4.693	44.7	0.530	1.801	1	9.79
0.954	10.390	4.906	48.6	0.528	1.807	1	10.02
0.954	10.786	5.327	54.8	0.506	1.885	1	10.43

Polyethylene (branched Phillips)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{std} (km/s)
0.916	1.896	0.000	0.0	1.000	0.916	40	0.00
0.916	3.817	0.759	2.7	0.801	1.143	1	5.95
0.918	4.001	0.764	2.8	0.809	1.135	1	5.96
0.916	3.813	0.766	2.7	0.799	1.146	1	5.96
0.918	3.853	0.831	2.9	0.784	1.170	1	6.01
0.918	4.229	1.001	3.9	0.763	1.203	1	6.16
0.916	4.246	1.044	4.1	0.754	1.215	1	6.20
0.916	4.980	1.403	6.4	0.718	1.275	1	6.53
0.918	4.986	1.419	6.5	0.715	1.283	1	6.54
0.916	5.100	1.447	6.8	0.716	1.279	1	6.57
0.916	5.602	1.766	9.1	0.685	1.338	1	6.87
0.916	5.546	1.832	9.3	0.670	1.358	1	6.92
0.916	6.540	2.441	14.6	0.627	1.462	1	7.50
0.916	6.777	2.494	15.5	0.632	1.449	1	7.56
0.918	6.713	2.541	15.7	0.621	1.477	1	7.60
0.916	7.102	2.705	17.6	0.619	1.480	1	7.77
0.916	7.321	2.833	19.0	0.613	1.494	1	7.90
0.918	7.285	2.946	19.7	0.596	1.541	1	7.99
0.916	7.473	3.042	20.8	0.593	1.545	1	8.09
0.916	7.728	3.243	23.0	0.580	1.578	1	8.28
0.916	8.077	3.469	25.7	0.571	1.605	1	8.51
0.916	8.421	3.665	28.3	0.565	1.622	1	8.71
0.916	8.406	3.766	29.0	0.552	1.659	1	8.79
0.916	9.029	4.138	34.2	0.542	1.691	1	9.17
0.916	8.978	4.152	34.1	0.537	1.704	1	9.18
0.916	9.548	4.510	39.4	0.528	1.736	1	9.55
0.916	9.574	4.528	39.7	0.527	1.738	1	9.56
0.916	9.969	4.827	44.1	0.516	1.776	1	9.86

Polyvinyl Chloride (Boltaron-Mosites)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{std} (km/s)
1.376	1.930	0.000	0.0	1.000	1.376	40	0.00
1.376	3.353	0.716	3.3	0.786	1.750	1	5.95
1.376	3.717	0.942	4.8	0.746	1.843	1	6.16
1.376	4.375	1.359	8.2	0.689	1.996	1	6.56
1.376	4.397	1.362	8.2	0.690	1.993	1	6.57
1.376	4.962	1.700	11.6	0.657	2.093	1	6.91
1.376	5.017	1.760	12.1	0.649	2.119	1	6.97
1.376	5.853	2.368	19.1	0.595	2.311	1	7.59
1.376	5.907	2.396	19.5	0.594	2.315	1	7.62
1.376	6.127	2.536	21.4	0.586	2.348	1	7.77
1.376	6.140	2.563	21.7	0.583	2.362	1	7.79
1.376	6.366	2.753	24.1	0.568	2.424	1	7.99
1.376	6.734	3.043	28.2	0.548	2.510	1	8.29
1.376	6.826	3.092	29.0	0.547	2.515	1	8.35
1.376	7.082	3.258	31.7	0.540	2.548	1	8.53
1.376	7.357	3.413	34.5	0.536	2.567	1	8.70
1.376	7.417	3.499	35.7	0.528	2.605	1	8.79
1.376	7.752	3.648	38.9	0.529	2.599	1	8.97
1.366	7.797	3.676	39.1	0.529	2.584	1	8.99
1.376	7.812	3.679	39.5	0.529	2.601	1	9.00
1.376	7.959	3.889	42.6	0.511	2.690	1	9.21
1.376	8.148	4.081	45.7	0.499	2.756	1	9.41
1.376	8.368	4.155	47.8	0.503	2.733	1	9.51
1.376	8.427	4.228	49.0	0.498	2.761	1	9.58
1.376	8.818	4.382	53.2	0.503	2.735	1	9.77
1.376	8.736	4.409	53.0	0.495	2.778	1	9.79
1.376	8.699	4.416	52.9	0.492	2.794	1	9.79
1.376	8.640	4.420	52.5	0.488	2.817	1	9.78
1.376	9.100	4.564	57.2	0.498	2.761	1	9.98
1.376	9.062	4.614	57.5	0.491	2.803	1	10.02
1.376	9.592	4.907	64.8	0.488	2.817	1	10.36

Polyvinylidene Fluoride (Kynar-Pennsalt)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.768	1.850	0.000	0.0	1.000	1.768	40	0.00
1.766	3.562	0.642	4.0	0.820	2.154	1	5.93
1.766	3.604	0.662	4.2	0.816	2.163	1	5.95
1.766	3.897	0.816	5.6	0.791	2.234	1	6.11
1.766	3.963	0.869	6.1	0.781	2.262	1	6.16
1.766	4.573	1.255	10.1	0.726	2.434	1	6.56
1.768	5.136	1.569	14.2	0.695	2.546	1	6.91
1.768	5.167	1.627	14.9	0.685	2.580	1	6.97
1.766	6.057	2.192	23.4	0.638	2.767	1	7.60
1.766	6.042	2.215	23.6	0.633	2.788	1	7.62
1.766	6.279	2.341	26.0	0.627	2.816	1	7.77
1.766	6.355	2.359	26.5	0.629	2.809	1	7.79
1.766	6.569	2.536	29.4	0.614	2.877	1	7.99
1.766	6.891	2.809	34.2	0.592	2.982	1	8.29
1.766	6.910	2.864	34.9	0.586	3.016	1	8.35
1.766	7.264	3.004	38.5	0.586	3.011	1	8.53
1.766	7.400	3.164	41.4	0.572	3.085	1	8.70
1.766	7.479	3.242	42.8	0.567	3.117	1	8.79
1.766	7.785	3.419	47.0	0.561	3.149	1	9.00
1.766	8.152	3.789	54.6	0.535	3.300	1	9.41
1.768	8.479	3.916	58.7	0.538	3.285	1	9.58
1.768	8.730	4.091	63.1	0.531	3.327	1	9.79
1.766	8.652	4.101	62.7	0.526	3.358	1	9.78
1.768	8.931	4.238	66.9	0.525	3.365	1	9.96
1.766	9.055	4.240	67.8	0.532	3.321	1	9.98
1.766	9.412	4.578	76.1	0.514	3.439	1	10.36
1.768	9.208	4.578	74.5	0.503	3.516	1	10.33

Polychlorotrifluoroethylene (Kel F-Fluorocarbon)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
2.133	1.501	0.000	0.0	1.000	2.133	40	0.00
2.131	3.132	0.604	4.0	0.807	2.640	1	5.90
2.131	3.152	0.689	4.6	0.781	2.728	1	5.98
2.133	3.485	0.869	6.5	0.751	2.841	1	6.17
2.133	3.465	0.905	6.7	0.739	2.887	1	6.21
2.134	4.113	1.221	10.7	0.703	3.035	1	6.56
2.132	4.113	1.247	10.9	0.697	3.059	1	6.58
2.134	4.669	1.546	15.4	0.669	3.190	1	6.93
2.134	4.658	1.565	15.6	0.664	3.214	1	6.95
2.131	5.462	2.052	23.9	0.624	3.413	1	7.52
2.133	5.517	2.088	24.6	0.622	3.432	1	7.56
2.134	5.796	2.295	28.4	0.604	3.533	1	7.80
2.132	5.974	2.343	29.8	0.608	3.508	1	7.87
2.132	6.483	2.745	37.9	0.577	3.698	1	8.34
2.134	6.779	2.841	41.1	0.581	3.674	10	6.69
2.133	6.913	2.900	42.8	0.581	3.674	1	8.56
2.132	6.907	2.912	42.9	0.578	3.686	10	6.77
2.134	6.959	2.934	43.6	0.578	3.689	1	8.60
2.133	7.156	3.064	46.8	0.572	3.730	1	8.76
2.134	7.484	3.305	52.8	0.558	3.821	1	9.05
2.132	7.971	3.652	62.1	0.542	3.935	1	9.48
2.132	8.590	4.017	73.6	0.532	4.005	1	9.94
2.132	8.658	4.064	75.0	0.531	4.018	1	9.99
2.132	8.631	4.068	74.9	0.529	4.033	1	9.99

Polytetrafluoroethylene (Teflon-Dupont)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
2.151	1.139	0.000	0.0	1.000	2.151	40	0.00
2.152	2.889	0.662	4.1	0.771	2.792	1	5.94
2.153	2.822	0.709	4.3	0.749	2.875	1	5.98
2.152	3.255	0.847	5.9	0.740	2.909	1	6.14
2.153	3.235	0.921	6.4	0.715	3.010	1	6.21
2.152	3.707	1.087	8.7	0.707	3.045	10	4.92
2.152	3.913	1.206	10.2	0.692	3.110	1	6.53
2.153	3.907	1.263	10.6	0.677	3.181	1	6.58
2.152	4.512	1.540	14.9	0.659	3.267	1	6.91
2.153	4.518	1.550	15.1	0.657	3.278	1	6.92
2.153	4.457	1.569	15.1	0.648	3.323	1	6.94
2.152	4.645	1.687	16.9	0.637	3.379	10	5.50
2.153	4.903	1.788	18.9	0.635	3.389	10	5.61
2.153	5.453	2.046	24.0	0.625	3.446	1	7.52
2.152	5.430	2.072	24.2	0.618	3.480	1	7.54
2.153	5.516	2.109	25.1	0.618	3.486	1	7.59
2.153	5.717	2.242	27.6	0.608	3.542	1	7.75
2.154	5.729	2.289	28.2	0.600	3.587	10	6.12
2.152	5.770	2.321	28.8	0.598	3.600	10	6.15
2.156	5.895	2.378	30.2	0.597	3.614	1	7.91
2.154	5.927	2.409	30.7	0.594	3.629	10	6.24
2.152	5.990	2.410	31.1	0.598	3.601	1	7.95
2.153	6.036	2.425	31.5	0.598	3.599	1	7.97
2.153	6.291	2.606	35.3	0.586	3.675	1	8.19
2.152	6.379	2.614	35.9	0.590	3.646	10	6.46
2.152	6.655	2.748	39.4	0.587	3.665	1	8.38
2.155	6.551	2.856	40.3	0.564	3.820	10	6.69
2.152	6.723	2.897	41.9	0.569	3.781	10	6.75
2.149	6.751	2.921	42.4	0.567	3.788	10	6.77
2.152	7.084	3.062	46.7	0.568	3.790	1	8.76
2.152	7.377	3.261	51.8	0.558	3.857	10	7.13
2.152	7.625	3.377	55.4	0.557	3.863	1	9.16
2.152	7.673	3.451	57.0	0.550	3.911	1	9.24
2.152	7.910	3.508	59.7	0.557	3.867	1	9.33
2.152	7.848	3.565	60.2	0.546	3.943	10	7.45
2.152	8.003	3.711	63.9	0.536	4.013	10	7.60
2.151	8.040	3.748	64.8	0.534	4.030	10	7.64
2.152	8.390	3.818	68.9	0.545	3.949	1	9.72
2.152	8.575	3.987	73.6	0.535	4.022	1	9.92
2.152	8.664	4.008	74.7	0.537	4.005	1	9.95
2.152	8.602	4.050	75.0	0.529	4.067	1	9.98
2.152	8.604	4.078	75.5	0.526	4.091	1	10.01
2.152	9.153	4.375	86.2	0.522	4.123	1	10.40

Polypropylene (Avisun)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
0.904	2.140	0.000	0.0	1.000	0.904	40	0.00
0.904	3.939	0.730	2.6	0.815	1.110	1	5.93
0.904	3.983	0.753	2.7	0.811	1.115	1	5.95
0.904	4.295	0.933	3.6	0.783	1.155	1	6.11
0.904	4.332	0.997	3.9	0.770	1.174	1	6.16
0.904	5.019	1.447	6.6	0.712	1.270	1	6.56
0.904	5.509	1.846	9.2	0.665	1.360	1	6.92
0.904	5.678	1.887	9.7	0.668	1.354	1	6.97
0.904	6.710	2.538	15.4	0.622	1.454	1	7.59
0.904	6.702	2.575	15.6	0.616	1.468	1	7.62
0.904	6.979	2.725	17.2	0.610	1.483	1	7.77
0.904	7.193	2.941	19.1	0.591	1.529	1	7.97
0.904	7.567	3.157	21.6	0.583	1.551	1	8.19
0.903	7.646	3.216	22.2	0.579	1.559	1	8.24
0.904	7.673	3.273	22.7	0.573	1.576	1	8.29
0.904	7.706	3.334	23.2	0.567	1.593	1	8.35
0.903	8.340	3.712	28.0	0.555	1.627	1	8.73
0.904	8.448	3.769	28.8	0.554	1.632	1	8.79
0.904	8.628	3.955	30.8	0.542	1.669	1	8.97
0.904	8.802	3.977	31.6	0.548	1.649	1	9.00
0.904	9.269	4.400	36.9	0.525	1.721	1	9.41
0.904	9.570	4.563	39.5	0.523	1.728	1	9.58
0.904	9.831	4.771	42.4	0.515	1.757	1	9.79
0.904	9.704	4.783	42.0	0.507	1.783	1	9.78
0.904	10.040	4.967	45.1	0.505	1.789	1	9.98
0.904	9.832	4.970	44.2	0.494	1.828	1	9.96
0.903	10.163	5.000	45.9	0.508	1.778	1	10.02
0.904	10.440	5.327	50.3	0.490	1.846	1	10.33
0.904	10.613	5.339	51.2	0.497	1.819	1	10.36
0.903	10.411	5.418	50.9	0.480	1.883	1	10.40
0.903	10.507	5.435	51.6	0.483	1.871	1	10.43

Poly-(4-methyl-1-pentene) (DX816-Imperial, TPX)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
0.829	1.806	0.000	0.0	1.000	0.829	40	0.00
0.830	2.798	0.489	1.1	0.825	1.005	10	4.33
0.830	3.019	0.594	1.5	0.803	1.033	10	4.41
0.830	3.706	1.009	3.1	0.728	1.141	10	4.75
0.829	3.738	1.013	3.1	0.729	1.137	1	6.14
0.830	4.032	1.225	4.1	0.696	1.192	10	4.93
0.830	4.464	1.459	5.4	0.673	1.233	1	6.53
0.829	4.446	1.461	5.4	0.671	1.235	1	6.53
0.830	4.927	1.766	7.2	0.641	1.294	10	5.39
0.831	4.951	1.804	7.4	0.636	1.307	10	5.42
0.831	4.910	1.805	7.4	0.632	1.314	10	5.42
0.830	4.918	1.816	7.4	0.631	1.316	10	5.43
0.831	4.902	1.816	7.4	0.629	1.320	10	5.43
0.831	4.947	1.859	7.6	0.624	1.331	10	5.47
0.831	4.939	1.860	7.6	0.624	1.333	10	5.47
0.829	5.073	1.873	7.9	0.631	1.314	1	6.89
0.830	5.146	1.912	8.2	0.628	1.321	1	6.93
0.830	5.167	1.951	8.4	0.622	1.334	1	6.96
0.830	5.239	1.976	8.6	0.623	1.333	10	5.57
0.829	6.199	2.546	13.1	0.589	1.407	1	7.52
0.827	6.242	2.595	13.4	0.584	1.415	1	7.56
0.829	6.262	2.662	13.8	0.575	1.442	1	7.62
0.830	6.451	2.772	14.8	0.570	1.456	10	6.26
0.831	6.419	2.773	14.8	0.568	1.462	10	6.26
0.827	6.666	2.806	15.5	0.579	1.428	1	7.77
0.830	6.634	2.904	16.0	0.562	1.476	10	6.38
0.827	6.808	2.945	16.6	0.567	1.458	1	7.90
0.831	7.078	3.248	19.1	0.541	1.536	10	6.67
0.831	7.078	3.248	19.1	0.541	1.536	10	6.67
0.830	7.094	3.250	19.1	0.542	1.532	10	6.68
0.829	7.160	3.258	19.3	0.545	1.521	1	8.19
0.827	7.313	3.359	20.3	0.541	1.530	1	8.28
0.829	7.547	3.464	21.7	0.541	1.532	1	8.39
0.830	7.553	3.562	22.3	0.528	1.571	10	6.95
0.829	7.779	3.620	23.3	0.535	1.551	1	8.54
0.827	7.925	3.777	24.8	0.523	1.580	1	8.68
0.829	8.038	3.798	25.3	0.527	1.572	1	8.72
0.829	8.428	3.952	27.6	0.531	1.561	1	8.88
0.830	8.344	4.129	28.6	0.505	1.643	10	7.45
0.830	8.657	4.261	30.6	0.508	1.635	10	7.57
0.829	8.698	4.275	30.8	0.509	1.630	1	9.18
0.830	8.721	4.310	31.2	0.506	1.641	1	9.21
0.830	8.800	4.474	32.7	0.492	1.688	10	7.75
0.829	9.080	4.516	34.0	0.503	1.649	1	9.42
0.829	9.329	4.575	35.4	0.510	1.627	1	9.49
0.829	9.575	4.602	36.5	0.519	1.596	1	9.54
0.830	9.309	4.801	37.1	0.484	1.714	1	9.68
0.830	9.606	4.836	38.6	0.497	1.672	1	9.74
0.830	9.715	4.994	40.3	0.486	1.708	1	9.88
0.830	9.426	5.013	39.2	0.468	1.773	10	8.22
0.830	9.777	5.040	40.9	0.484	1.713	1	9.93
0.830	10.328	5.484	47.9	0.469	1.770	1	10.36

Polyamide (Nylon 6/6-Polypenco 101)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{std} (km/s)
1.140	2.208	0.000	0.0	1.000	1.140	40	0.00
1.140	3.938	0.762	3.4	0.806	1.414	1	5.98
1.139	4.334	1.017	5.0	0.765	1.488	1	6.22
1.140	4.944	1.348	7.6	0.727	1.568	1	6.54
1.150	5.124	1.374	8.1	0.732	1.571	1	6.57
1.150	5.689	1.728	11.3	0.696	1.652	1	6.92
1.150	5.642	1.738	11.3	0.692	1.662	1	6.92
1.140	5.540	1.748	11.0	0.684	1.666	1	6.92
1.140	5.678	1.800	11.6	0.683	1.669	10	5.50
1.150	6.691	2.366	18.2	0.646	1.779	1	7.56
1.150	6.805	2.386	18.7	0.649	1.771	1	7.59
1.150	6.870	2.555	20.2	0.628	1.831	1	7.75
1.150	7.022	2.565	20.7	0.635	1.812	1	7.77
1.150	7.147	2.694	22.1	0.623	1.846	1	7.90
1.150	7.140	2.778	22.8	0.611	1.883	1	7.97
1.140	7.134	2.807	22.8	0.606	1.880	10	6.41
1.140	7.331	2.926	24.5	0.601	1.897	1	8.12
1.150	7.548	2.976	25.8	0.606	1.899	1	8.19
1.150	7.545	3.083	26.8	0.591	1.945	1	8.28
1.150	7.831	3.302	29.7	0.578	1.988	1	8.51
1.140	8.078	3.462	31.9	0.571	1.995	10	7.02
1.150	8.341	3.777	36.2	0.547	2.102	1	8.98
1.140	8.297	3.789	35.8	0.543	2.098	1	8.98
1.150	8.599	4.027	39.8	0.532	2.163	1	9.24
1.150	8.739	4.113	41.3	0.529	2.173	1	9.33
1.140	9.041	4.312	44.4	0.523	2.179	1	9.53
1.150	9.481	4.675	51.0	0.507	2.269	1	9.92
1.150	9.528	4.709	51.6	0.506	2.274	1	9.95
1.150	9.453	4.755	51.7	0.497	2.314	1	9.98
1.150	9.436	4.790	52.0	0.492	2.336	1	10.01
1.140	9.580	4.795	52.4	0.500	2.282	1	10.03
1.150	10.032	5.144	59.4	0.487	2.360	1	10.40

Polymethylmethacrylate (Rohm and Hass 11, Plexiglas)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.189	2.229	0.000	0.0	1.000	1.189	40	0.00
1.191	3.345	0.375	1.5	0.888	1.342	1	5.64
1.187	3.350	0.469	1.9	0.860	1.380	10	4.33
1.190	3.389	0.530	2.1	0.843	1.411	1	5.78
1.186	3.446	0.546	2.2	0.842	1.409	1	5.79
1.187	3.501	0.570	2.4	0.837	1.418	10	4.41
1.186	3.612	0.700	3.0	0.806	1.471	1	5.92
1.186	3.709	0.706	3.1	0.810	1.465	1	5.93
1.186	3.702	0.717	3.1	0.806	1.471	1	5.94
1.190	3.604	0.719	3.1	0.801	1.486	1	5.94
1.189	3.757	0.756	3.4	0.799	1.489	1	5.98
1.186	3.718	0.765	3.4	0.794	1.493	1	5.98
1.189	3.741	0.788	3.5	0.789	1.506	2	5.76
1.186	3.836	0.841	3.8	0.781	1.519	1	6.05
1.186	3.908	0.918	4.3	0.765	1.550	1	6.12
1.187	4.029	0.941	4.5	0.766	1.549	1	6.15
1.187	4.008	0.942	4.5	0.765	1.552	1	6.15
1.187	4.014	0.966	4.6	0.759	1.563	1	6.17
1.187	4.070	0.968	4.7	0.762	1.557	10	4.75
1.186	4.050	0.980	4.7	0.578	1.565	1	6.18
1.187	4.392	1.172	6.1	0.733	1.619	10	4.93
1.187	4.453	1.210	6.4	0.728	1.630	1	6.40
1.187	4.519	1.267	6.8	0.720	1.649	1	6.45
1.189	4.667	1.344	7.5	0.712	1.670	1	6.53
1.187	4.573	1.346	7.3	0.706	1.682	1	6.52
1.187	4.688	1.367	7.6	0.708	1.676	1	6.55
1.187	4.683	1.367	7.6	0.708	1.677	1	6.55
1.184	4.589	1.371	7.5	0.701	1.689	1	6.55
1.187	4.701	1.419	7.9	0.698	1.700	1	6.59
1.189	4.704	1.461	8.2	0.689	1.725	2	6.43
1.187	5.143	1.672	10.2	0.675	1.759	1	6.84
1.187	5.181	1.689	10.4	0.674	1.761	10	5.39
1.187	5.230	1.723	10.7	0.670	1.770	10	5.42
1.187	5.275	1.732	10.8	0.672	1.767	10	5.43
1.187	5.136	1.744	10.7	0.660	1.800	1	6.91
1.187	5.306	1.759	11.1	0.669	1.775	1	6.93
1.185	5.291	1.774	11.1	0.665	1.783	10	5.47
1.183	5.292	1.775	11.1	0.665	1.780	10	5.47
1.189	5.303	1.866	11.8	0.648	1.834	2	6.86
1.187	5.507	1.866	12.3	0.658	1.805	10	5.57
1.189	6.241	2.367	17.6	0.621	1.916	1	7.55
1.189	6.324	2.387	17.9	0.623	1.910	2	7.43
1.189	6.324	2.478	18.6	0.608	1.955	2	7.52
1.187	6.641	2.639	20.8	0.603	1.970	10	6.26
1.187	6.641	2.639	20.8	0.603	1.970	10	6.26
1.187	6.621	2.640	20.7	0.601	1.974	10	6.26
1.187	6.790	2.766	22.3	0.593	2.003	10	6.38
1.187	6.938	2.872	23.7	0.586	2.025	10	6.47
1.186	7.182	3.052	26.0	0.575	2.063	10	6.64
1.184	7.235	3.091	26.5	0.573	2.067	10	6.67
1.185	7.206	3.092	26.4	0.571	2.076	10	6.67
1.187	7.228	3.093	26.5	0.572	2.075	10	6.68
1.187	7.440	3.402	30.0	0.543	2.187	10	6.95
1.186	7.549	3.468	31.0	0.541	2.194	10	7.01
1.187	7.602	3.500	31.6	0.540	2.200	1	8.68
1.187	7.757	3.581	33.0	0.538	2.205	10	7.12
1.187	7.677	3.586	32.7	0.533	2.228	10	7.12
1.187	7.677	3.586	32.7	0.533	2.228	10	7.12
1.187	7.964	3.855	36.4	0.516	2.301	10	7.37
1.187	7.860	3.863	36.0	0.509	2.334	10	7.37
1.186	7.951	3.883	36.6	0.512	2.318	10	7.39
1.187	8.320	3.905	38.6	0.531	2.237	10	7.43
1.187	8.196	3.914	38.1	0.522	2.272	10	7.43
1.187	8.194	3.914	38.1	0.522	2.272	10	7.43
1.187	8.104	3.944	37.9	0.513	2.312	10	7.45

Polymethylmethacrylate (cont.)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{std} (km/s)
1.185	8.147	4.025	38.9	0.506	2.342	1	9.21
1.185	8.146	4.025	38.9	0.506	2.343	1	9.21
1.189	8.285	4.075	40.1	0.508	2.340	10	7.57
1.187	8.474	4.120	41.4	0.514	2.311	1	9.33
1.186	8.412	4.161	41.5	0.505	2.347	10	7.65
1.186	8.596	4.273	43.6	0.503	2.358	10	7.76
1.186	8.596	4.273	43.6	0.503	2.358	10	7.76
1.189	8.463	4.275	43.0	0.495	2.402	10	7.75
1.186	8.562	4.275	43.4	0.501	2.369	10	7.76
1.186	8.554	4.276	43.4	0.500	2.371	10	7.76
1.186	8.537	4.277	43.3	0.499	2.377	10	7.76
1.186	8.916	4.531	47.9	0.492	2.411	1	9.76
1.185	8.888	4.534	47.8	0.490	2.416	1	9.76
1.186	9.101	4.613	49.8	0.493	2.405	10	8.08
1.186	9.253	4.632	50.8	0.499	2.375	1	9.89
1.187	9.344	4.635	51.4	0.504	2.355	10	8.11
1.185	9.210	4.639	50.6	0.496	2.388	1	9.89
1.187	9.208	4.646	50.8	0.495	2.396	10	8.11
1.187	9.148	4.651	50.5	0.492	2.415	10	8.11
1.187	9.092	4.656	50.2	0.488	2.433	10	8.11
1.197	9.048	4.659	50.0	0.485	2.447	10	8.11
1.185	9.045	4.661	50.0	0.485	2.445	1	9.89
1.188	9.191	4.666	50.9	0.492	2.413	10	8.13
1.187	9.192	4.667	50.9	0.492	2.411	10	8.13
1.186	9.280	4.750	52.3	0.488	2.430	1	10.00
1.185	9.190	4.764	51.9	0.482	2.460	1	10.00
1.185	9.159	4.768	51.7	0.479	2.472	1	10.00
1.187	9.195	4.774	52.1	0.481	2.469	10	8.22
1.187	9.358	4.827	53.6	0.484	2.452	10	8.28
1.187	9.332	4.829	53.5	0.483	2.460	10	8.28
1.189	9.806	5.075	59.2	0.482	2.464	1	10.35
1.186	9.684	5.219	59.9	0.461	2.573	1	10.46
1.185	9.688	5.220	59.9	0.461	2.569	1	10.46
1.185	9.676	5.222	59.9	0.460	2.574	1	10.46
1.185	9.671	5.223	59.9	0.460	2.576	1	10.46

Polystyrene (Styrolux-Westlake)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.046	1.890	0.000	0.0	1.000	1.046	40	0.00
1.044	3.638	0.759	2.9	0.791	1.319	1	5.96
1.047	3.506	0.760	2.8	0.783	1.337	1	5.96
1.044	3.519	0.825	3.0	0.766	1.364	1	6.01
1.047	3.850	0.994	4.0	0.742	1.411	1	6.16
1.047	3.913	1.034	4.2	0.736	1.423	1	6.20
1.044	4.591	1.406	6.7	0.694	1.505	1	6.54
1.049	4.679	1.429	7.0	0.695	1.510	1	6.57
1.047	4.679	1.433	7.0	0.694	1.509	1	6.57
1.049	5.195	1.794	9.8	0.655	1.603	1	6.91
1.047	5.281	1.798	9.9	0.660	1.587	1	6.92
1.047	6.251	2.463	16.1	0.606	1.728	1	7.56
1.046	6.233	2.507	16.3	0.599	1.750	1	7.60
1.047	6.560	2.671	18.3	0.593	1.766	1	7.77
1.047	6.742	2.799	19.8	0.585	1.790	1	7.90
1.047	6.994	3.217	23.6	0.540	1.939	1	8.28
1.044	7.019	3.418	25.0	0.513	2.035	1	8.46
1.047	7.091	3.466	25.7	0.511	2.048	1	8.51
1.044	7.257	3.707	28.1	0.489	2.134	1	8.73
1.047	7.528	3.968	31.3	0.473	2.214	1	8.98
1.047	7.851	4.189	34.4	0.466	2.244	1	9.21
1.047	7.873	4.215	34.7	0.465	2.254	1	9.24
1.047	8.145	4.288	36.6	0.474	2.211	1	9.33
1.044	8.352	4.468	39.0	0.465	2.245	1	9.51
1.045	8.818	4.713	43.4	0.465	2.245	1	9.77
1.045	8.784	4.736	43.5	0.461	2.267	1	9.79
1.047	8.888	4.869	45.3	0.452	2.315	1	9.92
1.049	8.980	4.900	46.2	0.454	2.309	1	9.96
1.047	8.879	4.912	45.7	0.447	2.343	1	9.95
1.047	8.848	4.953	45.9	0.440	2.378	1	9.98
1.047	8.949	4.973	46.6	0.444	2.356	1	10.01
1.045	9.570	5.336	53.4	0.442	2.362	1	10.40
1.045	9.556	5.367	53.6	0.438	2.384	1	10.43

Cellulose Acetate (Tenite 1-Eastman)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.255	1.592	0.000	0.0	1.000	1.255	40	0.00
1.260	3.339	0.672	2.8	1.799	1.577	1	5.90
1.260	3.799	0.995	4.8	1.738	1.707	1	6.19
1.260	3.799	0.995	4.8	0.738	1.707	1	6.19
1.260	4.458	1.374	7.7	0.692	1.822	1	6.56
1.260	5.050	1.781	11.3	0.647	1.947	1	6.96
1.260	6.013	2.406	18.2	0.600	2.100	1	6.59
1.260	6.322	2.593	20.7	0.590	5.136	1	7.79
1.260	6.484	2.857	23.3	0.559	2.252	1	8.04
1.260	6.767	3.141	26.8	0.536	2.351	1	8.32
1.260	6.918	3.306	28.8	0.522	2.413	1	8.49
1.260	7.198	3.531	32.0	0.509	2.473	1	8.72
1.260	7.730	3.855	37.5	0.501	2.513	1	9.07
1.260	8.833	4.638	51.6	0.475	2.653	1	9.91
1.260	9.016	4.785	54.4	0.469	2.685	1	10.06
1.260	9.425	5.117	60.8	0.457	2.757	1	10.41

Epoxy (Epon 828-Shell)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{std} (km/s)
1.192	2.256	0.000	0.0	1.000	1.192	40	0.00
1.184	3.265	0.370	1.4	0.887	1.335	10	4.24
1.184	3.355	0.410	1.6	0.878	1.349	1	5.67
1.184	3.421	0.494	2.0	0.856	1.384	1	5.75
1.184	3.805	0.639	2.9	0.832	1.423	10	4.47
1.184	3.709	0.699	3.1	0.812	1.459	1	5.93
1.184	3.798	0.716	3.2	0.811	1.459	1	5.94
1.184	3.703	0.742	3.3	0.799	1.481	1	5.96
1.184	3.717	0.780	3.4	0.790	1.498	1	6.00
1.184	4.312	0.924	4.7	0.786	1.507	10	4.72
1.184	4.168	0.926	4.6	0.778	1.522	1	6.14
1.184	4.225	0.960	4.8	0.773	1.532	10	4.75
1.184	4.190	0.961	4.8	0.771	1.537	10	4.75
1.184	4.086	0.989	4.8	0.758	1.562	1	6.19
1.184	4.129	0.998	4.9	0.758	1.556	1	6.20
1.184	4.480	1.151	6.1	0.743	1.593	10	4.92
1.184	4.575	1.194	6.5	0.739	1.602	10	4.96
1.184	4.558	1.195	6.4	0.738	1.605	10	4.96
1.184	4.742	1.345	7.6	0.716	1.653	1	6.53
1.184	4.718	1.340	7.5	0.714	1.652	1	6.53
1.184	4.742	1.366	7.7	0.712	1.663	1	6.55
1.184	4.681	1.425	7.9	0.696	1.702	1	6.60
1.184	5.305	1.701	7.9	0.696	1.702	1	6.60
1.184	5.305	1.701	10.7	0.679	1.743	10	5.41
1.184	5.370	1.717	10.9	0.680	1.740	10	5.42
1.184	5.365	1.735	11.0	0.677	1.750	1	6.91
1.184	5.327	1.746	11.0	0.672	1.762	1	6.92
1.184	5.311	1.787	11.2	0.664	1.778	1	6.95
1.184	5.349	1.798	11.4	0.664	1.784	1	6.97
1.184	5.330	1.811	11.4	0.660	1.793	10	5.50
1.184	5.626	1.893	12.6	0.663	1.785	10	5.58
1.184	6.343	2.358	17.7	0.628	1.885	1	7.54
1.184	6.281	2.393	17.8	0.619	1.913	1	7.57
1.184	6.380	2.400	18.1	0.624	1.898	1	7.58
1.184	6.628	2.410	18.9	0.636	1.861	1	7.61
1.184	6.433	2.520	19.2	0.608	1.946	10	6.15
1.180	6.509	2.553	19.6	0.608	1.941	1	7.73
1.180	6.603	2.575	20.1	0.610	1.941	1	7.76
1.180	6.641	2.610	20.5	0.607	1.944	1	7.79
1.180	6.881	2.753	22.4	0.600	1.967	1	7.74
1.184	6.880	2.761	22.5	0.599	1.978	1	7.95
1.184	7.166	2.844	24.1	0.603	1.963	10	6.46
1.180	7.201	3.023	25.7	0.580	2.034	1	8.21
1.184	7.214	3.177	27.1	0.560	2.116	10	6.75
1.184	7.343	3.190	27.7	0.566	2.094	1	8.38
1.180	7.471	3.361	29.6	0.560	2.145	1	8.54
1.184	7.612	3.558	32.1	0.533	2.223	1	8.74
1.184	7.652	3.576	32.4	0.533	2.223	1	8.76
1.180	7.697	3.590	32.6	0.534	2.212	1	8.77
1.184	7.624	3.608	32.6	0.527	2.247	10	7.13
1.184	7.954	3.784	35.6	0.524	2.258	10	7.30
1.184	8.388	3.891	38.6	0.536	2.208	10	7.42
1.184	8.244	3.949	38.5	0.521	2.273	1	9.16
1.184	8.063	3.954	37.8	0.510	2.324	10	7.45
1.180	8.286	3.968	38.8	0.521	2.264	1	9.17
1.181	8.483	4.143	41.5	0.512	2.309	10	7.64
1.180	8.627	4.220	43.0	0.511	2.310	1	9.44
1.180	8.592	4.254	43.1	0.505	2.337	1	9.46
1.184	8.896	4.495	47.3	0.495	2.393	1	9.72
1.180	9.159	4.556	49.2	0.503	2.348	1	9.80
1.184	9.158	4.678	50.7	0.489	2.421	10	8.14
1.180	9.201	4.703	51.1	0.489	2.414	1	9.94
1.180	9.369	4.823	53.3	0.485	2.432	1	10.06
1.184	9.739	5.098	58.8	0.477	2.485	1	10.36
1.184	9.756	5.128	59.2	0.474	2.496	1	10.39
1.180	9.989	5.131	60.5	0.486	2.426	1	10.42
1.180	9.757	5.189	59.7	0.468	2.521	1	10.44

Phenolic (Durite HR 300-Borden)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.388	2.440	0.000	0.0	1.000	1.388	40	0.00
1.388	3.973	0.689	3.8	0.827	1.679	1	5.95
1.379	4.032	0.698	3.9	0.827	1.668	1	5.96
1.388	3.895	0.760	4.1	0.805	1.724	1	6.01
1.389	4.188	0.916	5.3	0.781	1.778	1	6.16
1.388	4.299	0.950	5.7	0.779	1.782	1	6.20
1.388	4.923	1.320	9.0	0.732	1.896	1	6.57
1.388	5.339	1.664	12.3	0.688	2.016	1	6.91
1.388	5.424	1.720	12.9	0.683	2.032	1	6.97
1.388	6.252	2.321	20.1	0.629	2.207	1	7.59
1.388	6.109	2.345	19.9	0.616	2.253	1	7.60
1.388	6.406	2.460	21.9	0.616	2.254	1	7.73
1.374	6.518	2.522	22.6	0.613	2.241	1	7.79
1.369	6.835	3.035	28.4	0.556	2.462	1	8.29
1.387	7.160	3.241	32.2	0.547	2.534	1	8.53
1.370	7.261	3.429	34.1	0.528	2.596	1	8.70
1.388	7.713	3.645	39.0	0.527	2.631	1	8.97
1.388	7.979	3.876	42.9	0.514	2.699	1	8.21
1.388	8.555	4.199	49.9	0.509	2.726	1	9.58
1.388	8.880	4.378	54.0	0.507	2.738	1	9.79
1.388	9.162	4.524	57.5	0.506	2.742	1	9.96
1.388	9.607	4.861	64.8	0.494	2.810	1	10.33
1.388	9.740	4.922	66.5	0.495	2.806	1	10.40
1.388	9.656	4.960	66.5	0.487	2.851	1	10.43
1.388	9.656	4.960	66.5	0.487	2.851	1	10.43

Phenoxy (PRDA8060-Union Carbide)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.178	2.173	0.000	0.0	1.000	1.178	40	0.00
1.181	3.699	0.666	2.9	0.820	1.440	1	5.90
1.181	4.088	0.993	4.8	0.757	1.560	1	6.19
1.181	4.769	1.374	7.7	0.712	1.659	1	6.56
1.181	5.385	1.781	11.3	0.669	1.765	1	6.96
1.181	6.344	2.413	18.1	0.620	1.906	1	7.59
1.181	6.642	2.603	20.4	0.608	1.942	1	7.79
1.181	6.870	2.862	23.2	0.583	2.024	1	8.04
1.181	7.133	3.150	26.5	0.558	2.115	1	8.32
1.181	7.199	3.327	28.3	0.538	2.196	1	8.49
1.181	7.415	3.563	31.2	0.519	2.274	1	8.72
1.181	8.920	4.631	48.8	0.481	2.456	1	9.84
1.181	9.236	4.837	52.8	0.476	2.479	1	10.06
1.181	9.684	5.169	59.1	0.466	2.533	1	10.41

Polycarbonate (Lexan)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.194	1.928	0.000	0.0	1.000	1.194	40	0.00
1.196	3.566	0.724	3.1	0.797	1.501	1	5.94
1.196	3.891	0.938	4.4	0.759	1.576	1	6.14
1.196	4.517	1.357	7.3	0.700	1.710	1	6.53
1.196	4.599	1.396	7.7	0.696	1.717	1	6.57
1.196	5.194	1.750	10.9	0.663	1.804	1	6.92
1.196	5.115	1.750	10.7	0.658	1.818	1	6.91
1.196	5.112	1.781	10.9	0.652	1.835	1	6.94
1.196	6.069	2.379	17.3	0.608	1.967	1	7.54
1.196	6.515	2.793	21.8	0.571	2.093	1	7.95
1.196	6.671	3.106	24.8	0.534	2.238	1	8.24
1.196	6.750	3.251	26.2	0.518	2.307	1	8.38
1.196	6.766	3.336	27.0	0.507	2.359	1	8.46
1.196	6.815	3.388	27.6	0.503	2.378	1	8.51
1.196	7.023	3.615	30.4	0.485	2.465	1	8.73
1.196	7.072	3.640	30.8	0.485	2.464	1	8.76
1.196	7.705	4.009	36.9	0.480	2.493	1	9.16
1.196	8.187	4.208	41.2	0.486	2.461	1	9.39
1.196	8.592	4.524	46.5	0.473	2.526	1	9.72
1.196	9.305	5.179	57.6	0.443	2.697	1	10.39

Polycarbonate (Merlon)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.191	1.924	0.000	0.0	1.000	1.191	40	0.00
1.191	2.949	0.420	1.5	0.858	1.389	1	5.67
1.191	3.189	0.501	1.9	0.843	1.413	1	5.75
1.191	3.380	0.647	2.6	0.809	1.473	10	4.47
1.191	3.506	0.727	3.0	0.793	1.503	1	5.94
1.191	3.465	0.752	3.1	0.783	1.521	1	5.96
1.191	3.987	0.931	4.4	0.766	1.554	10	4.72
1.191	3.861	0.940	4.3	0.756	1.574	1	6.14
1.191	3.815	0.976	4.4	0.744	1.600	1	6.17
1.191	3.880	0.999	4.6	0.742	1.604	1	6.19
1.191	4.191	1.159	5.8	0.723	1.646	10	4.92
1.191	4.321	1.279	6.6	0.704	1.692	1	6.45
1.191	4.522	1.358	7.3	0.700	1.702	1	6.53
1.191	4.378	1.359	7.1	0.690	1.727	1	6.52
1.191	4.529	1.378	7.4	0.596	1.712	1	6.55
1.191	4.541	1.429	7.7	0.685	1.738	1	6.59
1.191	4.979	1.684	10.0	0.662	1.800	1	6.84
1.191	5.113	1.752	10.7	0.657	1.812	1	6.91
1.191	5.133	1.760	10.8	0.657	1.812	1	6.92
1.191	5.123	1.818	11.1	0.645	1.846	10	5.50
1.191	6.040	2.384	17.1	0.605	1.968	11	7.54
1.191	6.092	2.408	17.5	0.605	1.969	11	7.57
1.191	6.305	2.438	18.3	0.613	1.942	1	7.61
1.191	6.215	2.530	18.7	0.593	2.009	10	6.15
1.191	6.512	2.796	21.7	0.571	2.087	1	7.95
1.191	6.666	2.872	22.8	0.569	2.092	10	6.46
1.191	6.652	3.186	25.2	0.521	2.286	1	8.31
1.191	6.649	3.212	25.4	0.517	2.304	10	6.75
1.191	6.811	3.247	26.3	0.523	2.276	1	8.38
1.191	7.082	3.642	30.7	0.486	2.452	1	8.76
1.191	6.989	3.651	30.4	0.478	2.494	10	7.13
1.191	7.527	3.992	35.8	0.470	2.536	10	7.45
1.191	7.673	4.017	36.7	0.476	2.500	1	9.16
1.192	7.769	4.149	38.4	0.466	2.558	10	7.60
1.192	7.788	4.192	38.9	0.462	2.582	10	7.64
1.192	8.152	4.218	40.9	0.483	2.468	1	9.39
1.192	8.550	4.535	46.2	0.470	2.536	1	9.72
1.192	8.562	4.671	47.6	0.454	2.621	10	8.13
1.192	9.108	5.213	56.6	0.428	2.785	1	10.39

Polyester (Clear Cast)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.210	2.070	0.000	0.0	1.000	1.210	40	0.00
1.210	3.610	0.701	3.1	0.806	1.502	1	5.93
1.210	3.928	0.896	4.3	0.772	1.567	1	6.11
1.210	3.984	0.999	4.8	0.749	1.615	1	6.20
1.210	4.611	1.359	7.6	0.705	1.716	1	6.54
1.210	4.638	1.386	7.8	0.701	1.726	1	6.57
1.210	5.182	1.737	10.9	0.665	1.820	1	6.91
1.210	5.200	1.768	11.1	0.660	1.833	1	6.94
1.210	5.234	1.798	11.4	0.656	1.843	1	6.97
1.210	6.159	2.417	18.0	0.608	1.991	1	7.59
1.210	6.186	2.425	18.1	0.608	1.990	1	7.60
1.210	6.443	2.617	20.4	0.594	2.038	1	7.79
1.210	6.735	3.147	25.6	0.533	2.271	1	8.29
1.210	6.920	3.391	28.4	0.510	2.373	1	8.53
1.210	7.148	3.558	30.8	0.502	2.409	1	8.70
1.210	7.497	3.810	34.6	0.492	2.460	1	8.97
1.210	7.612	3.822	35.2	0.498	2.430	1	8.99
1.210	7.800	4.047	38.2	0.481	2.515	1	9.21
1.210	8.439	4.376	44.7	0.481	2.513	1	9.58
1.210	8.636	4.580	47.9	0.470	2.577	1	9.79
1.210	8.678	4.685	49.2	0.460	2.630	1	9.89
1.210	8.925	4.732	51.1	0.470	2.576	1	9.96
1.210	9.296	5.095	57.3	0.452	2.677	1	10.33
1.210	9.311	5.099	57.4	0.452	2.675	1	10.33

Polyimide (Melden P1-Dixon)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.414	2.332	0.000	0.0	1.000	1.414	40	0.00
1.414	3.681	0.644	3.4	0.825	1.714	1	5.90
1.414	3.670	0.706	3.7	0.808	1.751	1	5.96
1.414	3.999	0.935	5.3	0.766	1.846	1	6.17
1.414	4.594	1.330	8.6	0.710	1.990	1	6.56
1.414	4.685	1.334	8.8	0.715	1.977	1	6.57
1.414	5.210	1.675	12.3	0.678	2.084	1	6.90
1.414	5.153	1.714	12.5	0.667	2.119	1	6.95
1.414	5.980	2.037	19.5	0.614	2.302	1	7.56
1.414	5.931	2.312	19.4	0.610	2.318	1	7.56
1.414	6.135	2.516	21.8	0.590	2.397	1	7.77
1.414	6.060	2.562	22.0	0.577	2.450	1	7.80
1.414	6.096	2.636	22.7	0.568	2.491	1	7.87
1.414	6.200	2.648	23.2	0.573	2.458	1	7.90
1.414	6.374	3.052	27.5	0.521	2.713	1	8.28
1.414	6.311	3.128	27.9	0.504	2.804	1	8.34
1.414	6.486	3.286	30.1	0.493	2.866	1	8.51
1.414	6.514	3.341	30.8	0.487	2.903	1	8.56
1.414	6.762	3.530	33.7	0.478	2.958	1	8.76
1.414	7.165	3.794	38.4	0.470	3.006	1	9.05
1.414	7.742	4.178	45.7	0.460	3.072	1	9.48
1.414	8.299	4.503	52.8	0.457	3.091	1	9.84
1.414	8.364	4.552	53.8	0.456	3.103	1	9.90
1.414	8.517	4.573	55.1	0.463	3.054	1	9.94
1.414	8.578	4.626	56.1	0.461	3.070	1	9.99
1.414	8.542	4.632	55.9	0.458	3.089	1	9.99

Polyphenylquinoxaline (NOL)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.205	2.270	0.000	0.0	1.000	1.205	40	0.00
1.207	3.404	0.710	2.9	0.791	1.525	1	5.93
1.199	3.720	0.735	3.3	0.902	1.494	1	5.96
1.209	3.583	0.799	3.5	0.777	1.556	1	6.01
1.208	3.738	0.906	4.1	0.758	1.594	1	6.11
1.209	3.945	0.960	4.6	0.757	1.598	1	6.16
1.206	4.530	1.365	7.5	0.699	1.726	1	6.54
1.205	5.025	1.767	10.7	0.648	1.859	1	6.92
1.206	5.129	1.776	11.0	0.654	1.845	1	6.94
1.210	6.059	2.427	17.8	0.599	2.019	1	7.59
1.205	5.981	2.447	17.6	0.591	2.039	1	7.60
1.208	5.808	2.453	17.2	0.578	2.091	1	7.59
1.206	5.821	2.463	17.3	0.577	2.090	1	7.60
1.198	5.918	2.610	18.5	0.559	2.144	1	7.73
1.204	5.962	2.618	18.8	0.561	2.146	1	7.75
1.206	6.055	2.862	20.9	0.527	2.287	1	7.97
1.204	6.174	3.095	23.0	0.499	2.415	1	8.19
1.209	6.352	3.135	24.1	0.506	2.387	1	8.24
1.209	6.515	3.359	26.5	0.484	2.496	1	8.46
1.209	6.839	3.629	30.0	0.469	2.576	1	8.73
1.209	7.505	4.088	37.1	0.455	2.655	1	9.21
1.209	8.000	4.354	42.1	0.456	2.653	1	9.51
1.209	8.357	4.622	46.7	0.447	2.705	1	9.79
1.209	8.666	4.837	50.7	0.442	2.736	1	10.02
1.209	9.274	5.182	58.1	0.441	2.740	1	10.40
1.209	9.178	5.225	58.0	0.431	2.807	1	10.43
1.209	9.178	5.225	58.0	0.431	2.807	1	10.43

Polysulfone (P 1700-Union Carbide)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.235	1.980	0.000	0.0	1.000	1.235	40	0.00
1.235	3.482	0.729	3.1	0.791	1.562	1	5.95
1.235	3.434	0.729	3.1	0.788	1.568	1	5.95
1.235	3.869	0.957	4.6	0.753	1.641	1	6.16
1.235	3.868	1.001	4.8	0.741	1.666	1	6.20
1.235	4.576	1.384	7.8	0.698	1.771	1	6.57
1.235	4.494	1.385	7.7	0.692	1.785	1	6.56
1.235	5.125	1.766	11.2	0.655	1.884	1	6.94
1.235	5.119	1.799	11.4	0.649	1.904	1	6.97
1.235	6.113	2.418	18.3	0.604	2.043	1	7.60
1.235	6.111	2.419	18.3	0.604	2.046	1	7.60
1.235	6.104	2.444	18.4	0.600	2.060	1	7.62
1.235	6.287	2.591	20.1	0.598	2.101	1	7.77
1.236	6.311	2.617	20.4	0.585	2.112	1	7.79
1.236	6.407	2.827	22.4	0.559	2.212	1	7.99
1.236	6.549	3.153	25.5	0.519	2.383	1	8.29
1.235	6.580	3.212	26.1	0.512	2.413	1	8.35
1.235	6.729	3.397	28.2	0.495	2.494	1	8.53
1.235	6.995	3.559	30.7	0.491	2.515	1	8.70
1.235	7.034	3.652	31.7	0.481	2.568	1	8.79
1.235	7.421	3.840	35.2	0.483	2.559	1	9.00
1.235	7.983	4.224	41.6	0.471	2.623	1	9.41
1.235	8.493	4.573	48.0	0.462	2.675	1	9.78
1.235	8.751	4.752	51.4	0.457	2.703	1	9.98
1.235	9.295	5.100	58.5	0.451	2.736	1	10.36

Polyurethane (CPR Polycast 1009-78)

ρ_o (g/cm ³)	u_s (km/s)	u_p (km/s)	P (GPa)	V/V_o	ρ (g/cm ³)	std	u_{sstd} (km/s)
1.265	2.068	0.000	0.0	1.000	1.265	40	0.00
1.262	3.644	0.659	3.0	0.819	1.541	1	5.90
1.262	4.007	0.983	5.0	0.755	1.672	1	6.19
1.262	4.681	1.358	8.0	0.710	1.778	1	6.56
1.262	5.269	1.762	11.7	0.666	1.896	1	6.96
1.262	6.298	2.376	18.9	0.623	2.027	1	7.59
1.262	6.570	2.565	21.3	0.610	2.071	1	7.79
1.262	6.795	2.821	24.2	0.585	2.158	1	6.04
1.262	7.099	3.100	27.8	0.563	2.240	1	8.32
1.262	7.177	3.273	29.6	0.544	2.320	1	8.49
1.262	7.389	3.505	32.7	0.526	2.401	1	8.72
1.265	7.836	3.749	37.2	0.522	2.425	1	8.99
1.262	7.801	3.844	37.8	0.507	2.488	1	9.07
1.262	8.975	4.542	51.4	0.494	2.555	1	9.84
1.265	8.877	4.602	51.7	0.482	2.627	1	9.89
1.262	2.019	4.610	52.5	0.489	2.581	1	9.91
1.262	9.245	4.750	55.4	0.486	2.596	1	10.06
1.265	9.516	5.009	60.3	0.474	2.671	1	10.33
1.262	9.764	5.066	62.4	0.481	2.623	1	10.41