Table 1
Isotropic elastic properties of forsterite.

Sample property	Unit	Polycrystalline data*				Single-crystal data**	
		Porous	Nonporous	Porous	Nonporous		
ρ	g/cm^3	3.021	3.217	3.164	3.217	3.222	3.224
V_p	km/sec	7.586	7.608	8.459	8.534	8.594	8.569
V_S	km/sec	4.359	4.369	4.938	4.977	5.033	5.015
ϕ	(km/sec)^2	32.24	32.42	39.03	39.82	40.08	39.89
σ_S	none	0.254	0.240	0.241	0.240	0.242	0.240
L_S	kb	1739	1862	2264	2343	2379	2367
μ	kb	574	614	772	797	816	810.8
K_S	kb	973.6	1043	1235	1281	1291	1286
dL_S/dp	none	6.53	6.94	7.27	7.51	7.40	7.77
$d\mu/dp$	none	1.30	1.32	1.80	1.85	1.82	1.80
dK_S/dp	none	4.80	5.19	4.87	5.04	4.97	5.37
R_p	per kb	0.00341		0.00294		–	–
R_S	per kb	0.00182		0.00206		–	–
Reference †		A		B		C	D

* Data entered under "porous" are the original experimental values reported by authors cited, and values listed under "nonporous" are corrected for porosity in accordance with the scheme presented in this paper.

** VRH values based on single-crystal data reported by authors cited.

† (A) Schreiber and Anderson [8]. Based on the same data, Anderson et al. [19, p. 494] list the value of $(dK_S/dp) = 4.87$ while in another report by Soga and Anderson [10, p. 2987] it gives 5.08. To avoid the apparent confusion, we used the original data presented by Schreiber and Anderson [8, p. 763]. (B) Chung [26]. (C) Graham and Barsch [27]. (D) Kumazawa and Anderson [28].

$$\left\{\frac{dK_S{}^o}{dp}\right\}_{p=0} = \left\{\frac{dL_S{}^o}{dp}\right\}_{p=0} - \frac{4}{3}\left\{\frac{d_\mu{}^o}{dp}\right\}_{p=0} \qquad (6)$$

where $L_S{}^o$, μ^o; and $K_S{}^o$ are the porosity-corrected values from step (a) and the superscript (^{o}) refers to the zero-porosity.

3. Testing of the scheme: examples.

3.1. *Forsterite*

Table 1 presents the isotropic elastic parameters of two porous samples of forsterite before and after the porosity correction. The first set of these acoustic data is due to Schreiber and Anderson [8] and the second set to Chung [26]. The polycrystalline sample used by Schreiber and Anderson has 6.09% porosity, whereas Chung's sample contains 1.65% porosity [14]. To be noted here is that values of dK_S/dp for porous forsterite samples found in [8] and [26] are 4.80 and 4.87, respectively; with the porosity correction according to the present scheme, these values become 5.19 and 5.04. As they are clearly seen from table 1, the porosity-corrected values compare very well with 4.97 [27] and 5.37 [28], the corresponding values determined on gem-quality forsterite single-crystals. The elasticity data at ambient conditions reported originally by Schreiber and Anderson [8] differ from the single-crystal data reported by Graham and Barsch [27] and Kumazawa and Anderson [28] as well as from Chung's [26] polycrystalline data. The probable reason here may be due to the presence of a secondary phase in their "forsterite" sample. The

Table 2
Isotropic elastic properties of corundum.

Sample property	Unit	Polycrystalline data*				Single-crystal data**
		Porous	Nonporous	Porous	Nonporous	
ρ	g/cm^3	3.972	3.986	3.974	3.986	3.986
V_p	km/sec	10.845	10.865	10.845	10.889	10.847
V_S	km/sec	6.373	6.383	6.377	6.398	6.402
ϕ	$(km/sec)^2$	63.47	63.72	63.39	64.00	63.02
σ_S	none	0.236	0.236	0.234	0.234	0.233
L_S	kb	4672	4705	4674	4726	4690
μ	kb	1613	1624	1616	1632	1634
K_S	kb	2521	2540	2519	2551	2512
dL_S/dp	none	6.33	6.36	6.51	6.57	6.58
$d\mu/dp$	none	1.76	1.77	1.77	1.79	1.73
dK_S/dp	none	3.98	4.01	4.16	4.19	4.27
R_p	per kb	0.001222		0.001259		–
R_S	per kb	0.000958		0.000960		–
Reference †		A		B		

* Data entered under "porous" are the original experimental values reported by authors cited, and values listed under "nonporous" are corrected for porosity in accordance with the scheme presented in this paper.
** VRH values based on single-crystal data reported by Wachtman et al. [36] and Gieske and Barsch [30].
† (A) Schreiber and Anderson [29]. (B) Chung and Simmons [17].

experience of this author indicates that the presence of secondary phases affects considerably the second-order elastic constants, but effects of these secondary phases on the pressure derivatives (particularly the value of dK_S/dp) are relatively small [26]. The unusually low values of both P and S velocities and the elastic constants as observed by Schreiber and Anderson [8] on their "forsterite" sample are believed to be associated with the presence of "barium aluminum silicate", the presence of which was noted by these authors.

3.2. *Corundum*

Table 2 lists two independent sets of the isotropic elastic parameters of polycrystalline corundum samples before and after the porosity correction. The first set of these acoustic data is due to Schreiber and Anderson [20] on a Lucalox alumina sample with 0.35% porosity, and the second set is due to Chung and Simmons [17] on a hot-pressed alumina sample with 0.35% porosity (Chung [2]; Anderson [3, p. 912; 4, p. 491]). Two sets of the acoustic data are generally in good agreement. It is noted that, with the porosity correction in accordance with the present scheme, values of the pressure derivatives compare well. It is also noted that these porosity-corrected values of the pressure derivatives compare very well with the corresponding values found on single-crystal corundum [30].

3.3. *Rutile*

Chung and Simmons [13] reported acoustic data on two porous rutile samples, one with 25% porosity and the other with 0.89% porosity. The property measured under pressure on the sample with 25% porosity was considered anomalous*, and these data

* It was noted earlier that the measured elastic properties of sample 1 (with 25% porosity) were considered anomalous.