TABLE III. The measured slopes of the stress dependences of the second-order elastic constants for three independent sets of measurements and the third-order elastic constants determined from them. The third-order elastic constants listed as "best" values were obtained by combining all of the data, and the "best"-value slopes were then calculated from them. The relation numbers refer to the relations in order in Tables I–III of Ref. 26.

Relation No.	Sample 2	Sample 1 before irradiation	Sample 1 after irradiation	"Best" values
1	$+7.59\pm0.13$	a	(7.5621 ± 0.13)	$+7.5621$
2	$+0.221\pm0.008$	a	(0.2235 ± 0.006)	$+0.2235$
3	$+6.90\pm0.12$	$+6.95\pm0.32$	(6.9456 ± 0.12)	$+6.9456$
4	$+0.844\pm0.016$	$+0.837\pm0.004$	(0.8400 ± 0.004)	$+0.8400$
5	$+0.232\pm0.008$	$+0.222\pm0.006$	(0.2235 ± 0.006)	$+0.2235$
6	a	a	a	$+0.1138$
7	a	a	a	$+1.6082$
8	a	a	a	-0.4432
9	small pos.	$+0.85\pm0.4$	not meas.	$+0.8891$
10	$+0.856\pm0.013$	$+0.774\pm0.044$	$+0.767\pm0.016$	$+0.8328$
11	-0.446 ± 0.042	-0.475 ± 0.050	-0.442 ± 0.070	-0.4432
12	small neg.	a	a	$+0.1138$
13	-2.34 ± 0.032	a	a	-2.3222
14	$+3.83\pm0.09$	a	a	$+3.4871$
15	small pos.	$+1.2\pm0.7$	not meas.	$+1.4651$
16	-0.49 ± 0.06	-0.54 ± 0.06	-0.502 ± 0.032	-0.4929
17	$+3.20\pm0.07$	$+3.14\pm0.05$	$+3.264\pm0.016$	$+3.2379$
C_{111}	-25.630 ± 0.33 [b]	-25.683 ± 0.66	-25.736 ± 0.26	-25.64 ± 0.25
C_{112}	-11.387 ± 0.27	-11.389 ± 0.60	-11.355 ± 0.24	-11.40 ± 0.25
C_{123}	-4.622 ± 0.33	-4.746 ± 0.65	-4.769 ± 0.26	-4.67 ± 0.25
C_{144}	-3.444 ± 0.11	-3.500 ± 0.13	-3.384 ± 0.17	-3.43 ± 0.10
C_{166}	-1.677 ± 0.06	-1.639 ± 0.065	-1.701 ± 0.09	-1.677 ± 0.05
C_{456}	$+1.360\pm0.16$	$+1.302\pm0.044$	$+1.387\pm0.031$	$+1.366\pm0.05$
$C_{111}+2C_{112}$	-48.404 ± 0.66	-48.460 ± 1.68	not meas.	-48.45 ± 0.66
$C_{144}+2C_{166}$	-6.799 ± 0.040	-6.779 ± 0.030	not meas.	-6.786 ± 0.030
$C_{111}-C_{123}$	-21.008 ± 0.16	-20.937 ± 0.040	not meas.	-20.967 ± 0.040

[a] These values could not be determined because of the crystallographic orientations of the samples.
[b] The units for all the third-order elastic constants are 10^{12} dyn/cm^2.

for the values of the three combinations of TOEC $(C_{111}+2C_{112})$, $(C_{144}+2C_{166})$, and $(C_{111}-C_{123})$, which were considered to be exact within the limits of their uncertainties based entirely on the uncertainties in the values of m_n estimated previously. Of the remaining uniaxial stress data, the data obtained using longitudinal ultrasonic waves were ignored because of their very large uncertainties, and data for relations (6), (7), and (8) could not be obtained because the samples were not of the right crystallographic orientation. The remaining relations, given in Table I, were then combined with the three relations obtained from the hydrostatic pressure data in such a manner as to obtain the best agreement with all the data taking into account their relative uncertainties.

The data for the polycrystalline samples were analyzed in a similar manner, again relying heavily on the hydrostatic pressure measurements.

TABLE IV. The adiabatic second-order elastic constants of two polycrystalline columbium samples at 298°K. A density of 8.578 g/cm^3 was used. The Voigt–Reuss–Hill average of the single-crystal elastic constants is shown for comparison.

		Sample A elongated $30\times75\ \mu$ grains	Sample B equiaxed $10\ \mu$ grains	Calculated by VRH approx. from single xtal data
$C_{11}=\lambda+2\mu$	10^{12} dyn/cm^2	2.179 ± 0.004	2.203 ± 0.004	2.2113
$C_{12}=\lambda$	10^{12} dyn/cm^2	1.433 ± 0.006	1.453 ± 0.006	1.4597
$C_{44}=\mu$	10^{12} dyn/cm^2	0.373 ± 0.001	0.375 ± 0.001	0.3758
E	10^{12} dyn/cm^2	1.041	1.048	1.0505
G	10^{12} dyn/cm^2	0.373	0.375	0.3758
K	10^{12} dyn/cm^2	1.682	1.703	1.7102
σ — Poisson's ratio		0.397	0.397	0.3977