Table 1

Values of the Interplanar Distances d_{obs} of the Orthorhombic Phase of Silica, Synthesized in Shock Waves and Also the Values of d_{cal} Calculated from the Parameters Given in [7].

d_{obs}	Intensity	hkl	d_{cal}	d_{obs}	Intensity	hkl	d_{cal}
3.15	Weak	110	3,175	–	–	022	1,626
2,59	Strong	111	2,594	1.58	Weak	220	1,588
2,35	Moderate	020	2,351	1,55	»	202	1,555
2.25	»	002	2,250	–	–	122	1.521
2.15	»	200	2,152	1,49	Moderate	221	1,497
2.08	Strong	021	2.084	1.35	Very weak	113	1,357
1.99	Weak	102	1.994	1,31	»	311	1,312
1.88	Very weak	121	1.875	–	–	222	1,297
–	–	112	1,836	1,24	Very weak	132	1,232

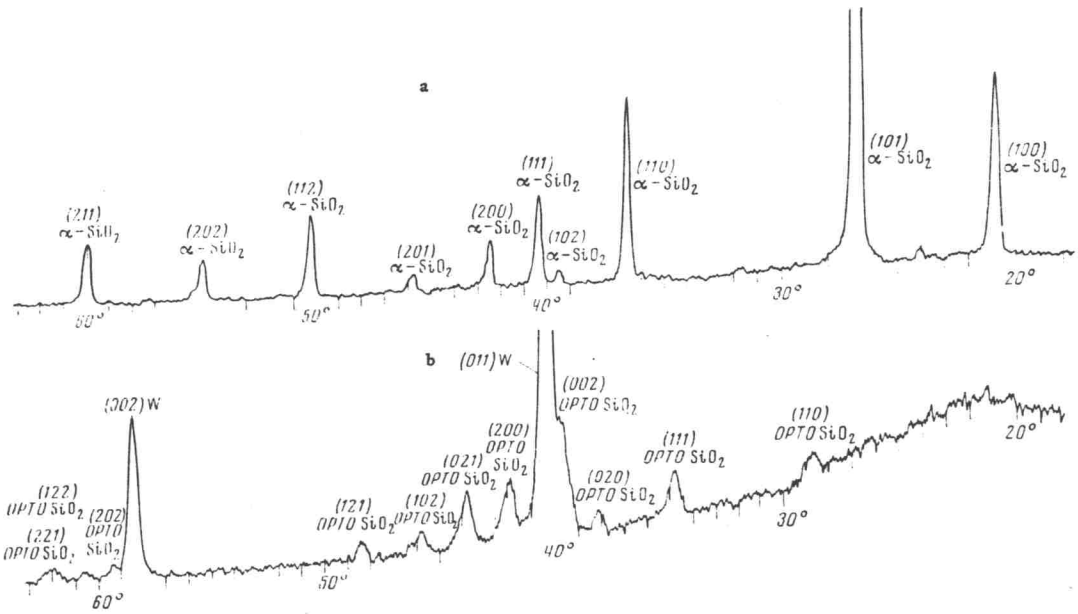

Fig. 4. Diffractogram of the silica sample: a) initial; b) after compression by a shock wave of amplitude P = 900 kbar.

special pellets were prepared for investigations with the diffractometer.

The results of the X-ray-structural measurements are set out in Table 1, where besides the observed values of the interplanar distances, we have given the corresponding values calculated from the lattice parameters of the orthorhombic phase of silica [7] a = 4.30, b = 4.70, c = 4.50 Å. Some typical diffraction patterns are displayed in Fig. 4. As in [4], the compression of the samples with the maximum pressures of 350 kbar did not appreciably alter the diffraction pattern: in place of the α-quartz lines one could observe a certain magnification of the diffuse background. The state of the samples after compression with pressures of 500 kbar was characterized by the absence of diffraction maxima and by well diffused backgrounds (especially in the region of small angles). These results were obtained irrespective of whether the scanning was done from the surface of the compressed sample or from the surface of the specially prepared pellet. In large pressures (700 to 900 kbar), one could observe, besides the background, a number of maxima which correspond to the orthorhombic lattice (with a sixfold anionic coordination) on the diffractograms obtained from both sample surfaces (front and rear) immediately in contact with the material of the container or the strip. The scanning of the powder pellets revealed that a large part of the substance is in a nonstructural amorphous state (perhaps in the form of the so-called short-range-order phase [6]). One could not identify the stishovite lines in any of the experiments.

Thus, the orthorhombic phase of silica is synthesized only in the surface layer of the sample, at its contact with the strip material. We should note here that this layer is intensely polluted by tungsten (strip material): on the diffractograms one could also identify the lines of this metal besides the lines of the orthorhombic phase. To verify the fact that the new lines are not the lines of the chemical compounds of tungsten with SiO_2, formed as a result of the shock, we laid out, between the samples and the tungsten discs, a tatalic foil of thickness 0.2 mm in some experiments which hardly changes the character of the silica loading. In this case also we could identify the lines of the orthorhombic phase of silica on the diffractograms. The probable cause for the formation of the orthorhombic phase of silica in the surface layer of the samples only should