TABLE 3

Comparison of the shock wave transformations and transformations caused by irradiative treatment (LASTMAN, 1963)

Minerals	Type of irradiative treatment	Type of transformation caused by shock wave treatment	Analogy with shock treatment
SiO_2 (quartz, glass)	Fast neutrons up to 2.10^{20} neutr./cm^2	I	Line broadening, decrease in SiO_2 density up to glass formation. Increase in glass density
$NaAlSi_3O_8$ $CaAl_2Si_2O_8$	Fast neutrons	I	Decrease in density up to formation of glass
ZrO_2 (monoclin.)	Fast neutrons up to 6.10^{19} neutr./cm^2	IIb	Decrease in the density and transformation to a new modification (to high temperature, cubic one with irradiative treatment; high pressure, rhombic one with the shock wave treatment)
$ZrSiO_4$	α-particles up to 3.10^{-4} α-particles/atom	IIa	Lattice deformation up to the X-ray amorphous state with decrease in density, decomposition to SiO_2 (X-ray amorphous) and ZrO_2 (various modifications)
	Fast neutrons up to 3.10^{20} neutr./cm^2	IIa	Decrease in density, disappearance of the far-order lines
Mg_2SiO_4	Fast neutrons	IIb	No observable change (except for disappearence of the weak lines)

$ZrSiO_4$, formed by natural radiation, was mentioned above. The same similarity can be stated for the other materials at conditions of shock compression (table 3). The radiation produced the basic effects of destruction of the lattice (LASTMAN, 1963). The main distinction of shock compression from radiation is the formation of high-pressure phases in shock experiments. It is possible to assume that the destruction of lattice in shock front is similar to that one produced by radiation.

Many investigations show that the basic processes characteristic of shock compression (destruction of lattice, formation of high-pressure phases, polymerisation) proceed in the short time of the existence of high pressure (about 10^{-6} sec) (BETSANOV *et al.*, 1965; DERIBAS *et al.*, 1967; ALTSHULER *et al.*, 1967; ADADUROV *et al.*, 1965). This is evidence of the abnormal speed of transformations in shock waves, exceeding by several orders the speed of the same processes under normal conditions. There is no common explanation of this anomaly in spite of some attempts in this direction (ALTSHULER *et al.*, 1967; ADADUROV, 1965).

Our conception is that the lattice is destroyed completely by a shock wave with energy exceeding a definite critical value depending on the properties of the powder.

In this case the material transforms into some "state of activation" similar to a strongly compressed gas (GLASSTONE *et al.*, 1941). This "state of activation" transforms into the glass-like phase for the framework silicates and SiO_2 and into the mixture of fine-grained crystalline phases for other materials under condition of high residual temperatures. In this case, destruction of the lattice and mixing of its elements creates the conditions for the formation of high-pressure and other phases. These phases form, possibly, in small quantities and transform partly into initial or metastable phases under the action of high residual temperature. As a rule, only the relics of these phases are observed, and the search of them is very complicated. The absence of high-pressure phases in the axial zone may be explained by the influence of residual temperature. Contrary to the axial zone, the intermediate zones are of the most interest. Possibly the using of oblique shock wave and the organisation of effective cooling will be useful for the increasing quantity of high-pressure phases after shock compression.

The absence of thermodynamic equilibrium in shock waves TROFIMOV, 1967 is the reason for the limited application of these experiments to geological problems, except possibly to the problem of meteorites. However,