Structural changes of cristobalite under dynamic and static pressures

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In this work the structural changes of cristobalite under the influence of high dynamic and static pressures were investigated. To create high dynamic pressures the samples were loaded by high temperature shock compression method similar that used in [1]. According to the method the samples put in copper ampoules were shock compressed using planar loading scheme. Shock waves were generated by aluminum plates accelerated with detonation products of various explosives to several km/s. Depending on experimental setup and explosive used pressure in samples were 14–37 GPa. Studies under static pressure (8 GPa) were carried out in toroid-type apparatus. After carrying out shock-wave and static experiments, the extracted samples, if necessary, were purified by boiling in acids. Then the samples were investigated by powder x-ray diffraction. New non cristobalite peaks were fixed on the diffractogram of cristobalite loaded to 14–28 GPa. The Rietveld analysis showed that the obtained diffractograms did not correspond to the structure of the original cristobalite. Comparison of x-ray diffraction patterns with x-ray diffraction data for other silica phases also showed no correspondence, i.e. one can talk about transformation of cristobalite into a new phase. Amorphization of cristobalite occur at a higher dynamic pressure. Experiments at static pressure confirm the formation of a new phase of silica under the dynamic loading. Analysis of the x-ray patterns of the new phase suggests that the structural changes of cristobalite are phase transformations without radical restructuring and changing the coordination number.