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High-Pressure Si Phases and the Mutual Orientation of Their Structures. HRTEM Studies

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As a result of high-resolution transmission electron microscopy (HRTEM) studies of silicon processed in a planetary mill in the presence of diamond powder, high-pressure phases were found: Si-III, Si-IV and Si-IX; moreover, a Si-IX particle with a length of more than 10 nm was detected by TEM methods for the first time. A study of the mutual orientations of the phases obtained allowed us to propose a scheme of transformations in silicon under pressure. We have shown that the Si-IX phase can be formed from Si-IV. The orientation relationship between Si-IV and Si-IX is established.

Keywords: silicon, transmission electron microscopy, plastic deformation, planetary mill, phase transformation.