Phase transformations in a strong short laser shock wave

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During absorption of a short (pico femtosecond) laser pulse near the metal surface a layer with a high temperature (first electron and then ionic) and practically unchanged solid density occurs, being, in consequence, under high pressure. At its unloading into the depths of matter goes shock wave (SW), which has a number of essential features. The arising shockwave has a triangular form. Thus, in iron at pressures in the SW, at which at slower compression (up to millisecond range pulses) there is a transition to the epsilon phase, at short-pulse action such transition was not observed. The application of the "method of inverse analysis of the free velocity surface velocity" [1, 2], and simulations show that the partial transition to the epsilon phase begins, but does not have time to occur [3, 4]. Titanium has a relatively small reflection coefficient and very small thermal conductivity (compared to other metals). This makes it possible to create in it by short laser pulses so strong SW that "cold" melting is possible. As a result, the thickness of the modified layer increases many times. [5].

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