PROBLEMS IN COMPARISON BETWEEN NATURAL AND EXPERIMENTAL SHOCKS.

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Introduction: Various shock metamorphic changes have been known mostly as solid products in meteorites and impactites experienced impact events. In fact, weak metamorphic changes will have been erased by strong impact events oocurred later. What we need to verify such shock metamorphisms is detailed observations and analyses of shock meramorphosed samples and firm experimental data based on reliable, controlled experiments. However, when and how an observed change occurred are also critical to understand the whole process of an impact. In case of violent impacts, melting and vparization may have occurred but most of the solid products may not be retained in the meteorites although some of them only may remain as solid products. Shock metamorphism is known to display heterogeneous and local response depending upon the initial condition and how hypervelocity impact occurred. Initial conditions differ in terms of fracture and pore, mineral spieces, surface state between target and projectile, temperature, and so on. In fact it may be offen difficult to define the initial conditions after strong shock event, especially after repeated similar impacts. Hypervelocity impacts generate high pressures and high temperatures, and pressure will be distributed to be equilibrated fast as the way shock wave propagates. Temperature distribution depends upon relatively slow thermal conductivity. Further decarbonation and dehydration after violent impacts may not indicate the original mineral above their critical shock pressures. For highly porous target materials, extremely high residual temperature may alter the effects of shock metamorphism through the subcequent annealing prosecc. When we consider every concerns in understanding the shock metamorphism based on investigation of natural samples, we may become restless and fidgeting. We as experimentists cannot evaluate every parameter for shock metamorphism on all of minerals and rocks in meteorites. The most important and critical issue is time scale in a comparison between natural samples and experimental results. We cannot simulate in long enough duration for transformation and reactions that are controlled by diffusion. Static high pressure experiments may help us to simulate such conditions, but at present I am not confident that static high pressure results satisfy always our understanding because static high pressure data also are subjected to kinetic problems as well as the effects of strain rate and initial state of sample [1].

How to improve: The basis for shock compression has been builded and theoretical considerations provide a firm guidance for shock metamorphism. In practical senses the shock compression process is very complicated. The condition achieved by shock compression is described macroscopically, but microscopical images in the compressed stae are still far from our understanding. For example, a high-pressure phase induced on the Hugoniot state is only propsed based on the pressure-density relation. The pressure-density relation could be satisfied even if a non-crystalline state. In order to define phases on the Hugoniot, we need to have directly structural information for the Hugoniot state. Recently very bright, short pulsed x-ray souces are available to measure *in-situ* diffraction from shock compressed materials. This technique may have a promising role on the structural changes in an impact process as well as the release process and such data have advantages to see the time scale problem and quenching process in meteorites and impactites.

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