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Physical condition produced by high-velocity impacts

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It has been generally recognized that impact phenomena occurred more frequently in LHB than the present time. Impact-induced compression waves and the associated rarefaction waves change the state and shape of matters in both of impactor and target. We can observe part of such materials after the dynamic process as meteorites or impactites. As well as three basic parameters of pressure, temperature, and duration, there are several critical factors to control the impact-induced physical sate such as the impact speed and angle, the initial state of matter, the size of impactor and so on. Recent studies provide estimation methods of pressure based on the experimental data but temperature is not so easy to be estimated because the initial state (especially porosity, its distribution, grains size, thermal conductivity, etc) affects greatly temperature rise even if compressed at a pressure. Pressure will be equilibrated faster, but temperature will be relatively slower. High-pressure minerals in meteorites are observed in the shock veins that display higher temperature than the surrounding host rock and that are not always equilibrated thermally. Therefore it is important to understand the mechanism of shock vein formation and local heating. We need to investigate how shock veins are formed through not only shock recovery experiments but also in-situ measurements of physical condition in the process of high-velocity impacts. I address importance to check temperature profile spatially and time-resolvedly to understand the formation mechanism.

Keywords: Physics and chemistry of impacts, Shock metamorphism, Experimental study, Shock temperature