Chemistry of impact-induced vapor cloud

Sohsuke Ohno[1]; Seiji Sugita[2]; Toshihiko Kadono[3]

[1] none; [2] Dept. of Complexity Sci. & Eng., Univ. of Tokyo; [3] ILE

A hypervelocity impact is one of the most common and important events over the history of the Earth, planets, and the solar system. The material compressed and heated by an impact is vaporized completely or partially and forms a vapor cloud. Impact vapor had played important roles during evolution of surface environment of planets, such as the killing mechanism during the K/T event.

Many previous studies have focused on impact vaporization or devolatilization. However, most of them discuss only about dynamic aspects such as fragmentation, cratering and compression or investigate only about thermodynamic aspects such as equation of state and Hugoniot. Nevertheless, more comprehensive understanding including both of dynamic and thermodynamic process is required, because the chemical reaction during an impact occurs during rapid increase and decrease of the temperature and pressure. Especially, it is important and required to construct scaling laws of impact vaporization or devolatilization.

The two most important parameters to evaluate the influence of impact vapor clouds on the evolution of planets are 1) how mach material are vaporized or released as gas and 2) the final chemical composition of released gas. In the talk, we show the method and results of our experimental studies about these problems and discuss about the application to the impact-induced atmospheric formation or the K/T event.