# Generation of carbon from limestone in water by laser shock

# Miklos Kedves[1], Yasunori Miura[2]

[1] Earth Sci., Yamaguchi Univ., [2] Earth Sci., Yamaguchi Univ

The laser plasma shock induced formation of carbon from limestone target has been observed on the confining plate for the first time. By applying different irradiation intensities and pulse durations, optimum laser intensity was found leading to maximum amount of deposited carbon phase. This high intensity value indicates the decisive role of the high temperature and high-pressure confined laser plasma shock in the generation of this carbon phase. Amount of carbon from

different target conditions of air, water and mixed iron metal in limestone lead to less amount of carbon in air condition. This result supports that there is anomalous high

amount of carbon soot at the end of the Cretaceous period induced by asteroid hit to the ocean of the Earth.

Irradiation of solid targets with intensive laser pulses leads to the hypervelocity impact interactions. By covering the target material with transparent media the plasma is confined which results in the enhancement of the generated shock wave pressures and durations several times compared with the free plasma arrangement. We are adapting this technique for the study of shock-induced material transformations of carbon-bearing targets. We are carrying out experimental studies by irradiating different carbon-containing limestone samples with a pulsed Nd-YAG laser through transparent confining media of quartz plate and water. The generated phases are analyzed by analytical scanning electron microscopy, X-ray diffraction, micro-Raman spectroscopy. We are doing computer calculations to reveal the physical conditions in the confined laser plasma created at the surface of different carbon-bearing solid targets. The formed carbon phase was collected on the confining plate for the first time. By applying different irradiation intensities and pulse durations, optimum laser intensity was found leading to maximum amount of deposited carbon phase. High intensity value indicates the decisive role of the high temperature and high-pressure confined laser plasma shock in the generation of this carbon phase. Amount of carbon from different target conditions of air, water and mixed iron metal in limestone lead to less amount of carbon in air condition. This result supports that there is anomalous high amount of carbon soot at the end of the Cretaceous period induced by asteroid hit to the ocean of the Earth.