# (11) Investigation of high velocity impact induced carbon material states by laser ablation techniques using carbon-bearing rock targets

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## Introduction

In the vicinity of the Barringer meteoritic impact crater relatively large diamond grains (compared to CVD) have been found by Miura. The presence of this carbon phase is attributed to the effect of the plasma formed by the high velocity impact (HVI) on the rock. The aim of the present studies is to establish this assumption by numerical and experimental investigations of the physical conditions, material characteristics and formation processes induced by HVI, as well as to apply this process to the efficient production of micro diamond or other new carbon material states.

## Experimental studies

1. It is known that the effects of HVI can be well modelled by laser irradiation of the solid target (e.g. Borodziuk and Kostecki). We carry out laser ablation of limestone targets with the subsequent analysis of the formed materials by ASEM.
2. By laser ablation on foils solid particles can be accelerated to high velocities (10-100km/s) and can be used in HVI experiments (Borodziuk and Kostecki). A novel method applies structured target layers so as to get small and reproducible particles (Zoletnik et al.). We would like to adapt this technique to HVI studies and to develop new methods to reach higher pellet velocities e.g. by resonant laser ionization of the vaporized material.
3. We are developing techniques to efficiently collect the carbon or micro diamond grains from these impact processes.

## Progress

1. Simple numerical estimations, in consonance with numerical simulations by Afanas'eva and Trushkov, suggest that the density of plasma formed by meteoritic impact is orders of magnitude higher than in the case of CVD.
2. Laser ablation experiments have been started by irradiating limestone samples by a pulsed Nd : YAG laser and collecting the ejected material by a transparent deposition substrate. Preparations have been made for the pellet acceleration studies too.

## References

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