Contribution ID: **101** Type: **Poster**

Nanostructured surfaces for nuclear astrophysics studies by laser-matter interactions

Tuesday, 20 June 2017 19:30 (2 hours)

The future availability of high-intensity laser facilities capable of delivering tens of Petawatts of power (e.g. ELI-NP) into small volumes of matter at high repetition rates will give the unique opportunity to investigate nuclear reactions and fundamental interactions under the extreme plasma conditions realized by laser-matter interactions.
Nuclear reactions of astrophysical interest are typically investigated by using ion beams that collide on fixed targets. However, the universe is composed of matter mainly in the form of plasma, where reaction mechanisms could change dramatically. For this reason, the investigation on reaction rates in plasma could provide important knowledge in astrophysics and cosmology.
In this context, targets made of nanostructured materials are giving promising indications to reproduce plasma conditions suitable for measurements of thermonuclear fusion reaction rates, in the domain of nanosecond laser pulses.
The present work gives the results of measurements performed with several kinds of nanostructured targets irradiated by laser pulses 6 ns long and at the energy of 2 Joules. The Nd:YAG laser installed at LENS laboratory of INFN-LNS in Catania has been used.
The nanostructured targets consist of aligned metal nanowires grown by electrodeposition into a porous alumina matrix, obtained on a thick aluminum substrate. These metamaterials were developed with specific geometrical parameters in order to maximize absorption in the visible and IR range. A strong enhancement of the plasma-produced X-ray flux has been observed, with some clear signatures about a "stagnation"of the plasma plume which is a critical condition for the self-thermalization of the system.
In perspective, this kind of alumina matrices could be filled with the atomic species needed to investigate specific nuclear reactions, in laser-produced plasmas.

Primary author: ALTANA, Carmen (LNS)

Co-authors: MUOIO, Annamaria (LNS); Dr MASCALI, David (LNS); ODORICI, Fabrizio (BO); LANZALONE, Gaetano (LNS); MALFERRARI, Luciana (BO); FRASSETTO, Marco (INFN-Sezione di Bologna); TUDISCO, Salvatore (LNS)

Presenter: ALTANA, Carmen (LNS)

Session Classification: Poster session