Contribution ID: **105** Type: **Študenti fyzika**

Study of laser ablation of Cu as a material suitable for thermonuclear reactor walls

Wednesday, November 26, 2025 3:39 PM (1 minute)

This study investigates laser ablation of materials relevant for thermonuclear reactor walls under various laser irradiation conditions. Copper was selected as the target material due to its high thermal and electrical conductivity and relevance in fusion technology. The study is focused on laser ablation processes using a EKSPLA NT342C laser system operating at a wavelength of 532 nm with nanosecond laser pulses energies set to 25 mJ and 35 mJ. The experimental setup also includes a diffuser and a UV-quality plano-convex fused silica lens to focus the laser on the sample. The optical emission spectroscopy (OES) signal from the laser-generated plasma is analyzed using an echelle spectrometer (ME5000, Andor Tech) and an iCCD camera (iStar DH743, Andor Tech) with a time resolution of 5 ns. The study aims to understand the ablation mechanisms and optimize the laser settings to increase the ablation efficiency and enhance the accuracy of depth analysis. Through a series of kinetic studies with different numbers of pulses (80, 40, 20, 10, 5, and 1), the ablation rate is calculated and the characteristics of the craters are analyzed using Keyence VK-X scanning confocal microscopy. Plasma parameters, including electron temperature, are determined using Boltzmann plots. The results show a clear influence of self-absorption on spectral lines, with visible changes in intensity and width at higher plasma densities. In addition, the depth of the craters increases with the number of laser pulses and the energy of the laser pulse which is then visualized through 3D reconstructions of craters created the aforementioned energies.
In conclusion, this work provides a comprehensive analysis of laser ablationon copper sample, offering valuable insights for optimizing material processing techniques for applications in thermonuclear reactors. The findings emphasize the importance of precise control of laser parameters to achieve the desired ablation results,and thereby advancing materials for fusion technologies. Further studies could include research on the influence of different laser wavelengths and pulse frequencies on ablation efficiency and a more detailed investigation of thermal effects on material surfaces.

Pracovisko fakulty (katedra)/ Department of Faculty

Department of Experimental Physics

Tlač postru/ Print poster

Nebudem požadovať tlač posteru / I don't require to print the poster

Author: KYSIL, Vladyslav

Co-authors: Dr HAŠKO, Daniel (CVTI SR -ILC, Ilkovičova 3, 812 19 Bratislava, Slovakia.); Dr VEIS, Matej (Department of Experimental Physics, FMPI, Comenius University, Mlynská dolina F2, 84248 Bratislava, Slovakia); Prof. VEIS, Pavel (Department of Experimental Physics, FMPI, Comenius University, Mlynská dolina F2, 84248 Bratislava, Slovakia); Dr ATIKUKKE, Sahithya (Department of Experimental Physics, FMPI, Comenius University, Mlynská dolina F2, 84248 Bratislava, Slovakia)

Session Classification: Poster session + káva: prezentácie vedeckých výsledkov FMFI UK Zamestnanci Fyzika

Track Classification: Poster session + káva: prezentácie vedeckých výsledkov FMFI UK Zamestnanci: Poster session + káva: prezentácie vedeckých výsledkov FMFI UK Zamestnanci Fyzika