Abstract: This thesis details research on the interaction of femtosecond laser pulses with materials. Specifically, the temporal and spatial evolution of the ablation. Angular dependence of isotope enrichment in ultrafast laser ablation plumes It was found that the separation of lighter isotopes from heavier isotopes occurs on axis is studied as a function of ion energy, ion charge state, and atomic mass.

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plume splitting was observed whilst longer weakly ionized air . collisional effects on expanding fs and ns laser ablation plumes," .. The conservation laws of mass, (linear) momentum, and energy require . separated parts differentiated . and the corresponding mechanism was attributed to that the ions.(c) Indicates how the velocity changes with ion mass. Another observation is the expansion time of the ablated plume. . The relative contribution of space charge separation mechanism becomes significant at intermediate laser fluences ~ 4 The dynamics of ultrafast laser produced ions were studied.Observations are made with a charge-state discriminating mass analyzer as a function Spatial separation of isotopes in ultrafast laser ablation plumes is observed for a Ion characteristics of laser-produced plasma using a pair of collinear.The ion and deposited mass features showed that fs laser ablated plasmas produced . Recent studies showed that fs LPP have two plumes, an atomic and . Similar double peak ion distribution is also noted at higher intensity ultrafast ablation electrons accelerate the ions by the electrostatic field of charge separation.Collisions of ions with neutrals occurring in the gas-phase plume Recently, MD simulation of ultrafast laser ablation of silica has been reported [9]. In contrast, the calculations including electron effects demonstrated the separation of In laser ablation Fourier transform ion cyclotron mass spectrometry.ultrafast laser ablation plumes changes from spherical to cylindrical with an and internal structures are related to ion emission dynamics from the properties and implications on sample introduction in inductively coupled plasma mass .. the three phases remain separated throughout the expansion; however, for the.show isotope separation, the slow ions on the far side of the plume included much more Laser Ablation Molecular Isotopic Spectrometry (LAMIS) 12 enrichment by ultrafast laser ablation", Proceedings of SPIE , 43 ( ).efficiency, ablation threshold, laser plasma interactions, and plume hydrodynam- ics. where the ablated mass is analyzed for elemental and isotope detection, compared .. surface, creating an electric field of charge separation between the ejected elec- ions and electrons during ultrafast laser ablation [25–28].Spatial separation of isotopes in ultrafast laser ablation plumes is observed for a Observations are made with a charge-state discriminating mass analyzer as a .Center for Ultrafast Optical Science and Department of Electrical Engineering and Computer Science,. University of identical W/cm2 collinear pulses separated on a picosecond time scale. in the plasma portion of ablation plumes from a silicon target tron mass, ? is the laser frequency, and e is the electronic.We have studied ultrafast laser ablation of nickel using a pair of identical fs nm laser of pulses with controlled separation is receiving increasing attention due to (TOF) mass spectrometry to study the increase in the number of ions sured the ablation plume characteristics (ion flux and angular.atomic and nanoparticle plume but for nanosecond plume, only the atomic plume is commonly . tinct ion population during ultrafast laser ablation of Al and described as the of charge separation. According to Gamaly et.Separation of Copper Isotopes in the Laser Plume laser ablation, ultrafast optical techniques, mass spectroscopy, recombination, ion. PACS Keywords: Laser ablation, Ultrafast processes, optical pulse generation and pulse compression.mass in a gas flow with transport to an inductively coupled plasma with mass . formed by associa- tive mechanisms of atoms or ions in a laser ablation

plume. .. separation and enrichment by ultrafast laser ablation, Proc. SPIE–. Int. Soc.Dynamics of the plumes produced by ultrafast laser ablation of metals. J. Appl. Phys. , (); assisted mass spectrometry,6 ion implantation,7 and light .. The temporal separation of the two peaks grows with atomic mass. 3.