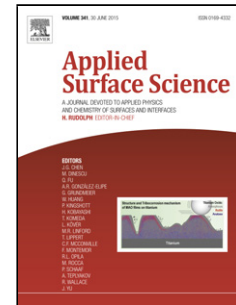


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Possible Evidence of Coulomb explosion in the femtosecond laser ablation of metal at low laser fluence

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We use a computational model to study the ablation mechanism of metal target irradiated by femtosecond pulse laser. It is confirmed that the Coulomb explosion can occur during femtosecond laser ablation of metal. The influence of thermal ablation and Coulomb explosion on the ablation depth is respectively investigated. Comparing the calculated results with the experimental ones, we find that the theoretical results which consider the thermal ablation only agree well with the experimental ones at high laser fluence, and those which take the Coulomb explosion into account fit well with the experimental ones at lower laser fluence, which exactly explains the ablation mechanism. In contrast with the previous theoretical results which only consider the thermal ablation, our theoretical simulation describes the ablation mechanism straightforward by making comparison of ablation depth, and provides a more reasonable explanation that fits with the actual ablation process.

Keywords: Coulomb explosion, femtosecond laser, ablation

PACS: 42.62.-b, 66.10.C-, 79.20.-m

1. Introduction

With the development of laser technology, researchers can take advantage of laser to accomplish the requirements of many practical applications, such as, the micro-machining [1, 2] and laser propulsion [3, 4] *etc.* These applications attract more and more researchers to devote themselves to the investigation of the laser ablation mechanism, and some details of the ablation

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