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光谱

激光诱导镍等离子体发射光谱Stark展宽和电子密度的空间分辨特性

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摘要: 在大气环境下利用脉冲Nd:YAG激光532nm输出烧蚀Ni靶, 产生了激光等离子体。在350-600nm波长范围内测定了激光诱导等离子体中Ni原子的空间分辨发射光谱。得到了385.83nm发射光谱线的Stark展宽及其随径向的变化特性。由发射光谱线的强度和Stark展宽计算了等离子体电子密度, 并讨论了激光等离子体的空间演化特性。结果表明, 在沿激光束方向上, 当距离靶表面0-2.5mm范围内变化时, 谱线的Stark展宽、线移和电子密度都随距靶面距离的增大而先增大, 在离靶面约1.25mm处时达到最大值, 之后随距离的进一步增大而减小; 电子密度在0.1-3.0 10^{16}cm^{-3} 范围内变化。

关键词: 激光物理 激光诱导Ni等离子体空间分辨谱 斯塔克展宽 电子密度

Spatial-resolved property of Stark broadening and electron density of emission spectra in laser-induced Ni plasmas

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Abstract: In atmospheric environment, it generated the laser plasmas by the ablation of Ni target by using a 532 nm Pulsed Nd:YAG laser beam. The spatially-resolved emission spectrum of Ni atom in the laser induced plasma was measured in the wavelength region from 350 to 600nm. The spatial-evolution of the Stark broadening of the Ni 385.83nm emission spectral line and its radial distribution were also obtained. The electron density of plasmas was calculated from the measured intensity and Stark broadening of emission spectral line, the spatial evolution property of the electron density was discussed. It is shown that Stark broadening(line broadening and line shift) of the spectral lines and electron density increased to its maximum firstly, then decreased along the direction of laser beam when the distance of the measured zone from the target surface was in the range of 0-2.5mm. The maximum value of Stark broadening of the spectral line and electron density appear at 1.25 mm from the target surface. The value of electron density change in the range of 0.1-3.0 10^{16}cm^{-3} .

Keywords: laser physics the spatial-resolved spectrum of laser induced Ni plasma Stark broadening electron density

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