

Investigation of the features of inductively coupled thermal plasma jets

CHEN Lunjiang¹, CHEN Wenbo^{1,2}, LIU Chuandong¹, CHENG Changming¹, TONG Honghui¹
¹Southwestern Institute of Physics, China ²University of South China, China

The electron temperature is one of the important parameters of inductively coupled thermal plasma (ICTP). In order to get the characteristics of the plasma jets, the emission spectrum is a kind of important methods for thermal plasma diagnostics. The radiation intensity ratio of multiple Ar spectrum lines was used to estimate the electron excited temperature and the Boltzmann method was employed to calculate it at low atmospheric pressure. The impact of different axial distance on the electron excited temperature under Ar flow rate of 130slm was investigated. The results showed that the morphology of plasma jets was diffusion and then convergence, and the cave appeared at about $Z=60\text{mm}$ to $Z=100\text{mm}$ obviously. The electron excited temperature of the plasma jets was about 0.5579eV at the position of axial distance $Z=60\text{mm}$. With the axial distance of plasma jets increasing, the electron temperature was decreasing while the electron temperature gradient was increasing gradually. When the axial distance of $Z > 100\text{mm}$, the decreasing of gradient of electron temperature was became slowly. Those results can provide an experimental basis for the process optimization of plasma powder spheroidizing and materials processing areas.

References

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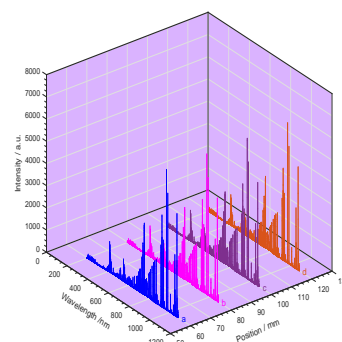


Fig.1 Emission intensity of plasma jets at (a) $Z=60\text{mm}$; (b) $Z=80\text{mm}$; (c) $Z=100\text{mm}$; (d) $Z=120\text{mm}$

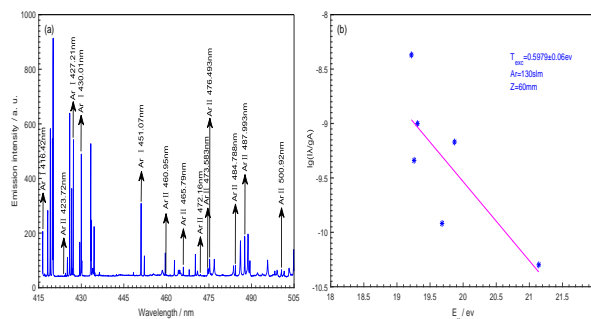


Fig.2 Images of (a) spectrum lines of Ar and (b) electronic excitation temperature at $Z=60\text{mm}$

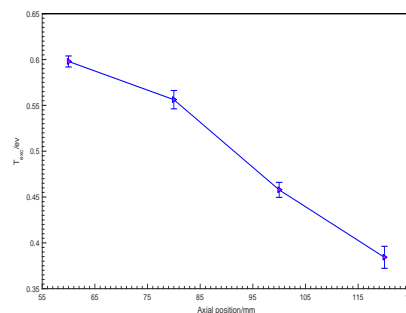


Fig.3 Electronic temperature of jets at different axial distance from the outlet of generator