

CHARACTERIZATION OF AN ATMOSPHERIC PRESSURE PULSED MICROJET

Laboratory for plasma spectroscopy and lasers

M. Vinić¹, B. Stankov¹, M. Ivković¹ and N. Konjević²

¹Institute of Physics, University of Belgrade, Belgrade, Serbia ²Faculty of Physics, University of Belgrade, Belgrade, Serbia

Abstract

The results of an experimental study of atmospheric pressure pulsed microjets in helium and gas mixture are presented. The images of plasma jet propagation were recorded and emission spectra from glass discharge tube and plasma jet were analyzed and compared. From helium spectral lines electron density was calculated for several different configurations of discharge source. Temporal dependence of electron density was determined. The influence of various capacitors and discharge voltages on plasma jet emission and propagation were studied also.

Experiment



List of	different	configu	irations of	of microje	2
	and the second s				

	label	a [mm]	b [mm]	c [mm]	d [mm]			
	MJ1	4	0.50	0	0.50			
	MJ2	4	0.70	6	0.10			
	MJ3	4	0.70	15	0.10			
- A.	MJ4	4	0.70	0	0.35			
Naw.	MJ5	4	0.70	6	0.35			
	MJ6	4	0.45	6	0.35			
	MJ7	2	0.70	6	0.35			
	MJ8	2	0.45	6	0.35			
	MJ9	1	0.70	0	0.35			
1 h	MJ10	1	0.70	6	0.35			
	MJ11	1	0.45	6	0.35			

Electrical parameters

List of used capacitors, applied voltages and current densities

In order to obtain optimal

 $0.33 \mu F$ capacitor was mounted. When

Plasma diagnostic Determination of Ne



there is no plasma propagation, i.e. plasma stays in contact with upper electrode.







1,0x10⁴ -

5.5 µs.







discharge tube emission.



Molecular bands of N2 were detected in spectra of microjet (MJ11) when gas mixture was used as carrier gas. This is an indication that plasma jet temperature is low, but temperature couldn't be estimated because of large instrumental width of lines.

Conclusion

From different configurations of microjet that were examined, several conclusions were made. Appearance and intensity of jet depends from parameter d, which should not be smaller than 0.3 mm and parameter b, which should be at least 2d. Also, optimum ratio of parameters a and b must be set in order for jet to appear.

Ne value depends strongly from microjet configuration, especially from ratio of parameters a/b. Best results were obtained with a=2 mm and b=0,5 mm. In that case, electron density in jet varied from 0.1-0.5×10²³ m⁻³, while in discharge tube was 0.5-7.0×10²³ m⁻³. Ne value of microjet was very high when b=0.7 mm, for every examined value of a.

Molecular bands of N₂ were detected in spectra of microjet when gas mixture was used as carrier gas. This is an indication that plasma jet temperature is low.

Acknowledgements: This work was financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia under Project OI 171014 and TR 37019.

- 1 ΡΟΤИΡΑЈΥЋΑ ΜΕΤΑ
- 2—Nd-YAG ЛАСЕР Molectron MY34
- 3 CTTEKTPOMETAP Andor Shamrock 303-i
- 4 ЈЕДИНИЦА ЗА КАШЊЕЊЕ
- 5 ОСЦИЛОСКОП
- 6 ВН НАПАЈАЧ
- 7 КОНДЕНЗАТОР
- 8 СТРУЈНА СОНДА
- 9 ФОТО ДИОДА