CONTENTS

			page	
abstract			i	
acknowledgen	nents		v	
contents			v	
chapter one	INTRODUCTION			
	1.1	The hollow cathode discharge		
	1.2	Applications of the hollow cathode discharge	4	
	1.3	The hollow cathode effect	7	
	1.4	Objectives and layout of thesis	9	
chapter two	REV	/IEW OF THE HOLLOW CATHODE DISCHARGE		
	CHARACTERISTICS			
	2.1	Breakdown characteristics		
	2.2	Electrical characteristics		
		2.2.1 Current density	15	
		2.2.2 Voltage-current (V-i) characteristics	-18	
		2.2.3 Radial and axial potential distribution	2	
	2.3	Electron energy distribution function and electron		
		density	24	
	2.4	Ion energy distribution and ion density	32	
	2.5	Spectral emission characteristics	34	
	2.6	Sputtering action	3	

	2.7	Nume	rical mod	elling of the hollow cathode discharge	40
hapter three	EXPERIMENTAL SETUP AND CONSIDERATIONS				
	3.1 The hollow cathode arrangement				43
	3.2	Hollow cathode discharge circuitry			46
		3.2.1	Breakdo	own characteristics of the hollow	
			cathode	discharge	48
			3.2.1.1	The Paschen's relation	48
			3.2.1.2	Mapping of the spatial electric field	
				distribution and tracing the electric	
				field lines	51
		3.2.2	Voltage	-current(V-i) characteristics of the	
			hollow	cathode discharge after breakdown	54
			3.2.2.1	Current density magnification j/j_0 in	
				the hollow cathode discharge	55
			3.2.2.2	The dynamic resistance dV/di	57
	3.3	Langr	nuir prob	e	59
		3.3.1	Langmu	ir probe circuitry	64
		3.3.2	Digital	data processing of Langmuir probe	
			characte	eristic	68
	3.4	Setup	for line e	mission studies	72
		3.4.1	Temper	ature determination from the relative	
			intensit	ies of spectral lines of the same atomic	
			enecies		70

С

chapte	er four
--------	---------

BREAKDOWN AND ELECTRICAL

	CHARACTERISTICS					
	4.1	Break	down characteristics of the hollow cathode			
		discha	rge	81		
	4.2	Voltag	ge-current(V-i) characteristics of the hollow			
		cathoo	le discharge after breakdown	90		
		4.2.1	Identifying the fully developed hollow cathode			
			discharge regime from the $V-p(i \text{ fixed})$ plots	100		
		4.2.2	Current density magnification j/j_0 in the hollow			
			cathode discharge	110		
		4.2.3	Dynamic resistance dV/di in the hollow			
			cathode discharge	113		
chapter five	PLA	ASMA (CHARACTERISTICS FROM PROBE AND			
	SPECTRAL EMISSION MEASUREMENTS					
	5.1	Langr	Langmuir probe measurements			
		5.1.1	The electron temperature and its density	119		
		5.1.2	The electron energy distribution function	139		
	5.2	Specti	ral emission from the hollow cathode discharge	148		
		5.2.1	Radial intensity distribution in the hollow			
			cathode discharge	150		
		5.2.2	Total intensity of the emission lines from the			
			glow in the hollow cathode discharge	159		

			Content	
	5.2.3	Radial temperature profile in the hollow		
		cathode discharge	164	
	5.2.4	Cathode dark space width in the hollow		
		cathode discharge	169	
	5.3 Sputt	ering of the hollow cathode material	172	
chapter six	SUMMARY AND CONCLUSIONS			
	6.1 Sumr	nary and conclusions	17	
	62 8000	actions for further work	10	

184