## TABLE OF CONTENTS

		e of Contents of Figures	vi ix
		of Tables	xi
	List of abbreviations		xii
	Absti		xiii
_			
1.	Intro	duction	2
	1.1	Historical background	2
	1.2	Surface instabilities	5
	1.3	Surface instability utilized to pattern surfaces	5
		1.3.1 Dewetting	5
		1.3.2 Phase separation of block copolymers and polymer blends	6
		1.3.3 Template guided structuration	6
		1.3.4 Electrohydrodynamic patterning	6
		1.3.5 Surface patterning due to Thermal-gradient	7
		1.3.6 Breadth figures	7
		1.3.7 Water-ions induced nanostructuration	7
		1.3.8 Nanobubble assisted nanopatterning	8
		1.3.9 Reaction-diffusion surface patterns	8
		1.3.10 Growth processes: crystal growth and aggregation	8
		1.3.11 Surface wrinkling	9
	1.4	Patterning of surfaces with polymer	9
		1.4.1 Top-down polymer patterning techniques	9
		1.4.1.1 Mask based patterning technique	10
		1.4.1.2 Printing and writing techniques	10
		1.4.1.3 Molding Techniques	11
		1.4.2 Bottom-up patterning techniques	11
		1.4.2.1 Macromolecular Assembly 1.4.2.2 Polymeric nano/microparticle assembly	12
		1.4.2.3 Layer by layer assembly	12
	1.5	Dewetting	13
		1.5.1 Reason for polymer to be chosen for film formation	16
		1.5.2 Necessary condition for film to become unstable	17
	1.6	Motivation	18
	1.7	Research objectives	19
	1.8	Structure of the thesis	19
	Refere	nces	20

2. The effect of dewetting liquid composition on the dewetting of polystyrene	30
thin film.	31
Abstract	31
2.1 Introduction	36
2.2 Materials and methods	36
2.2.1 Materials and chemicals	36
2.2.2 Equipments	36
2.2.3 Glasswares	37
2.2.4 Methods	37
2.2.4.1 Cleaning of silicon wafers	37
2.2.4.2 Spin coating	38
2.2.4.3 Dewetting procedure	41
2.3 Result and Discussion	41
2.3.1 Dewetting studies	46
2.3.1.1 Effect on instability wavelength( $\lambda$ )	47
2.3.1.2 Effect on droplet diameter(d)	48
2.3.1.3 Polymer is not soluble in dewetting mixture	51
2.4 Conclusion	52
References	32
3. The effect of surface properties on the length-scales of dewetting.	58
	58
Abstract	58
3.1 Introduction 3.1.1 The lotus effect	62
3.1.2 Surface Models and Characterization	64
3.1.2.1 Surface models	64
3.1.2.2 Wetting behaviour	65
	66
3.1.3 Conventional fabrication of hydrophobic surface	67
3.1.3.1 Creating a surface rough on hydrophobic material	67
3.1.3.2 Modifying a rough surface with hydrophobic coating	07
3.1.4 Chemical modification with silane	68
3.1.4.1 Formation of silane monolayer	68
3.1.4.2 Silane coupling agents	69
3.2 Materials and methods	70
3.2.1 Materials and chemicals	70
3.2.2 Equipments	70
3.2.3 Glasswares	70
3.2.4 Methods	71 71
3.2.4.1 Cleaning of Silicon wafers	71
3.2.4.2 Silanization 3.2.4.3 Dewetting procedure	72
3.2.4.3 Dewetting procedure	, 2
3.3 Result and Discussion	72

3.4 Conclusion	79	
References	79	
4. The formation of aligned droplets by dewetting of electrospinned Polystyrene nanofibers and its comparison with Rayleigh Plateau Instability	86	
Abstract	87	
4.1 Introduction	87	
4.1.1 Basic theory and mechanism	87	
4.2 Material and method	89	
4.2.1 Materials and Chemicals	89	
4.2.2 Equipments	90	
4.2.3 Glasswares	9(	
4.2.4 Methods	9( 9(	
4.2.4.1 Cleaning of glass slides	90 91	
4.2.4.2 Deposition of electrospinned Polystyrene fiber	92	
4.2.4.3 Dewetting procedure	72	
4.3 Results and Discussion	93	
4.3.1 Deposition of fibers on unsilanized substrates and annealed at lower temperature(60°C)	96	
4.3.2 Deposition of fibers on silanized substrate and annealed at lower temperature (60°C).	98	
4.3.3 Deposition of fibers on unsilanized substrate and annealing at a higher temperature (120°C).	100	
4.3.4 Deposition of fibers on silanized substrate and annealing at a higher temperature (120°C)	102	
4.3.5 Comparison with Rayleigh-Plateau instability model	104	
4.3.6 Multiple times dewetting	105	
4.4 Conclusion	103	
References	106	
. Conclusions and Future directions		
5.1 Conclusion	109	
5.2 Future directions	112	
List of Publications	114	