

INDEX

ACKNOWLEDGMENTS	3
RESUMEN	10
RESUM	12
SUMMARY	14
INTRODUCTION	20
Poly (glycerol sebacate) (PGS)	20
History of PGS.....	20
PGS synthesis and properties.....	21
PGS synthesis parameters and their influence on the final polymer characteristics	22
PGS applications.....	24
OBJECTIVES.....	28
CHAPTER 1: Unveiling the key synthesis mechanism for optimal poly(glycerol sebacate) hyperbranched polymer synthesis.....	30
ABSTRACT	30
INTRODUCTION	31
MATERIALS AND METHODS	34
General procedure for synthesis of Poly(glycerol sebacate) prepolymer and derivatives.	34
Characterisations.....	34
Fourier Transform Infrared Spectroscopy.....	34
Titration.....	34
¹ H-NMR spectroscopy	34
Gel permeation chromatography.....	35
Rheology measurements.....	35
Differential scanning calorimetry.....	35
RESULTS AND DISCUSSION.....	36
Effect of molecular configuration during prepolymerization	36
Glycerol and its asymmetrical hydroxyl reactivity during PGS synthesis.....	40
Glycerol influence on the kinetic of the PGS prepolymerization reaction.....	43
CONCLUSIONS	47
CHAPTER 2: Influence of pre-polymerisation atmosphere on the properties of pre- and poly(glycerol sebacate)	50
ABSTRACT	50
INTRODUCTION	51
MATERIALS AND METHODS	53
Preparation of pPGS pastes and PGS films.....	53

Characterization of pPGS pastes under different atmospheres	53
Degree of esterification of pPGSs	53
Fourier-Transform Infrared Spectroscopy	53
Differential Scanning Calorimetry measurements.....	54
Thermogravimetric analysis	54
Characterization of PGS cured after pre-polymerisation at different atmospheres	54
Viscosity tests.....	54
Wettability tests.....	54
Swelling at equilibrium.....	54
Density measurements	55
Mechanical compression tests.....	55
Dynamic Mechanical Spectroscopy.....	55
RESULTS AND DISCUSSION.....	56
Influence of the pre-polymerisation atmosphere on the pPGS degree of esterification ...	56
Influence of the pPGS degree of esterification on its thermal properties.....	58
Effect of the pre-polymerisation atmosphere on pPGS gelation.....	61
Effect of the pre-polymerisation atmosphere on the physicochemical properties of cured PGS	63
Effect of the pre-polymerisation atmosphere on thermal and mechanical properties of cured PGS	64
CONCLUSIONS	69
CHAPTER 3: Role of curing temperature of poly(glycerol sebacate) substrates on protein cell interaction and early cell adhesion	72
ABSTRACT	72
INTRODUCTION	73
MATERIALS AND METHODS	75
Materials	75
Fourier-Transform Infrared Spectroscopy	75
Wettability and surface tension tests	75
Substrate adsorption and protein quantification	75
Atomic Force Microscopy.....	76
Cell culture	76
Fluorescence staining and imaging.....	77
Cell viability assay.....	77
Data analysis.....	77
RESULTS AND DISCUSSION.....	78
Effect of the curing temperature on the chemical and surface properties of PGS films	78

Characterization and quantification of poly (glycerol sebacate) protein adsorption.....	80
Effect of PGS with HUVECs culture on early cell adhesion	85
Effect of Col I and Fn sequential and competitive adsorption on HUVECs focal adhesion.	86
CONCLUSIONS	90
GENERAL DISCUSSION.....	92
GLOBAL CONCLUSIONS	96
WORK IN PROGRESS AND FUTURE OUTLOOK.....	98
CONTRIBUTIONS.....	100
REFERENCES	104