

Table of Contents

Preface

Chapter 1: Materials, Equipment, Technologies and Conception of Using Digital Direct Manufacturing

Adaptive Platforms and Flexible Deposition System for Big Area Additive Manufacturing (BAAM)

R. Silva, P. Sereno, A. Mateus, G.R. Mitchell, P. Carreira, C. Santos, J. Vitorino and J. Domingues 3

Direct Digital Manufacturing in the Context of a Circular Economy

D.A. Fonseca and F.J.P. Simões 21

Study of Metal/Polymer Interface of Parts Produced by a Hybrid Additive Manufacturing Approach

M.R. Silva, J. Domingues, J. Costa, A. Mateus and C. Malça 34

High Efficiency Cooling and Heating Channels for Injection Moulding

P. Freitas, C. Santos, P. Carreira and A. Mateus 43

Industry 4.0 - Digital Twin Applied to Direct Digital Manufacturing

J. Vitorino, E. Ribeiro, R. Silva, C. Santos, P. Carreira, G.R. Mitchell and A. Mateus 54

Towards a Conceptual Notion for a Universal Printing Machine

N. Martins-Ferreira, N. Alves and G.R. Mitchell 61

Rosin Based Composites for Additive Manufacturing

D. Sousa, S. Biscaia, T. Viana, M. Gaspar, V. Mahendra, S.D. Mohan, A. Mateus and G.R. Mitchell 70

Rosin Product Review

V. Mahendra 77

Direct Digital Manufacturing of Nanocomposites

S.D. Mohan, M. Nazhipkyzy, P. Carreira, C. Santos, F.J. Davis, A. Mateus and G.R. Mitchell 92

Microstructure of Thermoplastic Composites Reinforced with Wool and Wood

C. Baptista, G. Martins, C. Santos, A. Mateus and F. Antunes 98

The Exploitation of Polymer Based Nanocomposites for Additive Manufacturing: A Prospective Review

I. Khan, C.S. Kamma-Lorger, S.D. Mohan, A. Mateus and G.R. Mitchell 113

Microwave Treatment of Polyacrylonitrile Powder Method Development and Effects of Surface Modification Porosity for Supercapacitor Devices or other Mobile Applications

S. Koutsonas, G.R. Mitchell and F.J. Davis 146

Numerical Thermal Analysis of a T Jump System Used for Studying Polymer Behaviour

S. Gomes, P. Pascoal-Faria, G.R. Mitchell, T. Gkourmpis and T. Youngs 155

A Computer Simulation of the Nitinol Thermal Expansion under Fast Varying Working Conditions

P. Castelo Ferreira, P. Pascoal-Faria, P. Carreira and N. Alves 162

Innovation and Entrepreneurship: From Schumpeter to Industry 4.0

V. Ferreira and A. Lisboa 174

A Computer Tool for 3D Shape Recovery of Fruits

M. Gaspar, P. Pascoal-Faria, S. Amado and N. Alves 181

Traffic Vertical Signposting: Materials Characterization and Structural Numerical Simulation

M.C. Franco, R. Fonseca, S. Gomes, S. Biscaia, F. Brites, P. Pascoal-Faria and A. Mateus 190

Polyethylene and the Nucleating Agent: Dibenzylidene Sorbitol, a Neutron Scattering Study

G.R. Mitchell, S. Pratumshat and R. Olley 199

The Use of Polypropylene and High-Density Polyethylene on Cork Plastic Composites for Large Scale 3D Printing

F. Brites, C. Malça, F. Gaspar, J.F. Horta, M.C. Franco, S. Biscaia and A. Mateus 205

Chapter 2: Biomedical Aspects of Direct Digital Manufacturing Technologies

A Brief Review on Processes for Cartilage Repair	
C. Moura, R. Santos-Rocha, S. Franco, C. Malça, C. Galhano, M. Henriques and P. Morouço	229
Smart Materials for Biomedical Applications: The Usefulness of Shape-Memory Polymers	
C. Fernandes, G.B. Heggannavar, M.Y. Kariduraganavar, G.R. Mitchell, N. Alves and P. Morouço	237
Sheep Gait Biomechanics and the Assessment of Musculoskeletal Conditions: A Systematic Review	
R. Silva, I.S. Dimas, J.W. Fernandez, N. Alves, P. Morouço, A.C. Maurício, A. Veloso and S. Amado	248
I. Film: Using Electrospinning to Create Bioactive Films	
A.R. Silva, P. Carreira, C. Santos, M. Reis and A. Mateus	260
Fabrication of Poly(Glycerol Sebacate)-Poly(ϵ-Caprolactone) Extrusion-Based Scaffolds for Cartilage Regeneration	
D. Reis, S. Biscaia, I.J. Seabra, A. Veloso and P. Morouço	268
Evaluation of Root Canal Filling with a Bioceramic Sealer Using Micro-Computed Tomography: A Pilot Study	
I. Vasconcelos, M.R. Pereira, A. Ginjeira, M.C. Franco, P. Morouço and N. Alves	275
A Novel Biomanufacturing System to Produce Multi-Material Scaffolds for Tissue Engineering: Concept and Preliminary Results	
T. Viana, S. Biscaia, E. Dabrowska, M.C. Franco, P. Carreira, P. Morouço and N. Alves	283
Characterization of Biocompatible Poly(Ethylene Glycol)-Dimethacrylate Hydrogels for Tissue Engineering	
J. Lopes, R. Fonseca, T. Viana, C. Fernandes, P. Morouço, C. Moura and S. Biscaia	290
Biomechanical Outcomes Related with Gait in Children with Cerebral Palsy Using Ankle-Foot Orthotic - A Systematic Review	
J.J. Gordo, P. Pascoal-Faria, A. Mateus, P. Morouço, V. Schiriati and S. Amado	301
Electrical Stimulation Optimization in Bioreactors for Tissue Engineering Applications	
P. Pascoal-Faria, P. Castelo Ferreira, A. Datta, S. Amado, C. Moura and N. Alves	314
Smart Polymers in Drug Delivery Applications	
G.B. Heggannavar, D. Achari, C. Fernandes, G.R. Mitchell, P. Morouço and M.Y. Kariduraganavar	324