

Contents

1	Introduction	1
1.1	Biomaterials for Orthopedic Applications	1
1.2	Currently Used Biomaterials and Their Drawbacks	2
1.2.1	Metals	2
1.2.2	Ceramics	6
1.2.3	Polymers	6
1.2.4	Composites	7
1.3	Requirements of Ideal Implants	7
1.3.1	Material	8
1.3.2	Mechanical Properties	8
1.3.3	Manufacturing of Implants	9
1.4	Pure Magnesium as a Biomaterial	10
1.5	Summary	11
	References	12
2	Synthesis of Magnesium-Based Biomaterials	17
2.1	Synthesis of Impermeable Magnesium Materials	17
2.1.1	Liquid-State Processing	17
2.1.2	Solid-State Processing	24
2.1.3	Additive Manufacturing	27
2.1.4	Secondary Processing of Impermeable Mg Materials	28
2.2	Synthesis of Porous Magnesium Materials	30
2.3	Summary	32
	References	32
3	Selection of Alloying Elements and Reinforcements Based on Toxicity and Mechanical Properties	35
3.1	Selection of Elements Based on Toxicity	35
3.1.1	Selection of Alloying Elements for Mg Alloys Based on Toxicity	38

3.1.2	Selection of Particulate Reinforcements for Mg Composites Based on Toxicity	39
3.2	Selection Based on Mechanical Properties	40
3.2.1	Selection of Alloying Elements Based on Mechanical Properties	40
3.2.2	Selection of Particulate Reinforcements Based on Mechanical Properties	54
3.2.3	Selection of Particulates and Porosity Levels for Porous Mg Materials.	60
3.3	Summary	62
	References	62
4	Selection of Alloying Elements and Reinforcements	
	Based on Degradation Properties	69
4.1	Selection Based on In Vitro Corrosion of Mg Materials	69
4.1.1	Corrosion Experiments.	69
4.1.2	Effects of Alloying Elements on Corrosion Properties of Mg Targeting Biomedical Applications	73
4.1.3	Effects of Particulate Reinforcements on Corrosion Properties of Mg Composites Targeting Biomedical Applications	88
4.1.4	Effect of Porosity Levels on Corrosion Behavior of Mg Materials	90
4.2	Selection Based on In Vitro Cytotoxicity and Cell Viability Test . . .	91
4.3	Summary	100
	References	106

Insight into Designing Biocompatible Magnesium Alloys
and Composites

Processing, Mechanical and Corrosion Characteristics

Gupta, M.; Meenashisundaram, G.K.

2015, XII, 109 p. 4 illus., 3 illus. in color., Softcover

ISBN: 978-981-287-371-2