

Preface

Biomaterials are natural or modified natural materials which are constantly in contact with a biological system. They continuously interact with the system and perform certain defined functions to enhance system life, quality and functionality. Both porous and impermeable biomaterials assist in replacement or repair of soft and hard tissues such as bones, cartilages, blood vessels and even entire organs. The desire for human beings to live longer, their higher expectations and the ever growing population has increased the demand for biomaterials and has made researchers to focus more on synthesizing new biomaterials which can perform its intended functions with minimal and acceptable reactions within human body. Investigating on new degradable metallic implants is one of the new interesting research areas of biomaterial science.

Magnesium is the sixth most abundant element in the earth's crust and is also the lightest of all the structural metals. With a low density of 1.74 g/cm^3 , magnesium materials have considerable potential for both selection and use as a lightweight structural and biocompatible materials. Magnesium has considerable advantages over other non-biodegradable metals and polymers, such as its ability to degrade in vivo without any harmful effects and lower elastic modulus (41–45 GPa), which is closer to that of cortical bone (7–30 GPa) and therefore magnesium is considered as a potential biomaterial especially for orthopedic applications as it mitigates stress shielding effects. The degradation properties of magnesium can be designed by addition of suitable alloying elements and reinforcements and degradable magnesium materials may potentially replace natural tissues. Therefore, the selection of alloying elements and reinforcements for magnesium materials is of prime importance. There has been no attempt so far to consolidate and summarize the available synthesis methodologies, mechanical and corrosion properties of biocompatible magnesium-based materials to provide insight into designing smarter futuristic magnesium alloys or composites for biomedical applications.

Accordingly, this book provides the readers an insight into the effects of various suitable alloying elements and particulate reinforcements on mechanical and degradation properties of pure magnesium and magnesium alloys currently targeted for biomedical applications. Along with the information on toxicity and the

recommended dosage levels of various elements on the human body, the various synthesizing methodologies utilized for impermeable and porous magnesium materials are also discussed. This book is targeted as an easy-to-read reference book for researchers, engineers, teachers and students primarily involved in designing and using new biocompatible magnesium alloys and composites.

Manoj Gupta
Ganesh Kumar Meenashisundaram

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