



Magnesium Biocorrosion—Common Errors to Best Practice

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Abstract:

For over 130 years, magnesium (Mg) and its alloys have been investigated for their potential use as a biomaterial. They offer a range of benefits as an implant material, especially due to their unique ability to act as a load-bearing implant while safely degrading in the body.

Although the development of a clinically relevant biomedical magnesium implant requires thorough animal testing (*in vivo*), several factors significantly hinder the effective use of *in vivo* tests, most notably the potential harm/discomfort for experimental subjects. Consequently it is vital to use laboratory (*in vitro*) tests to pre-screen Mg alloys, determining their suitability for subsequent *in vivo* studies.

There are several commonly used *in vitro* tests, from simple mass loss experiments to more complex electrochemical methods, which provide information on biocorrosion rates and mechanisms. Each method has its own unique benefits and limitations, and inappropriate test setup or interpretation of results creates the potential for flawed justification of subsequent *in vivo* experiments.

This presentation aims to elucidate the main benefits and limitations for each of the major *in vitro* methodologies that are currently used in examining the biodegradation behavior of Mg and its alloys. Relevant literature and critical appraisal of methods used by other authors has been synthesized with extensive understanding developed by presenter as in-house experiments were carried out.

Information obtained from this work greatly increases the understanding of the correct uses of the current biocorrosion experiments, ultimately providing a guide for future investigators to aid the planning of investigations for the purpose of exploring the degradation of Mg and its alloys.

Biography

Nicholas Kirkland is an Assistant Professor with the Department of Advanced Technology and Science for Sustainable Development at Nagasaki University, Japan. He previously worked at Monash University in Australia with Prof. Nick Birbilis and completed his PhD at the University of Canterbury in New Zealand. He has worked in the bio-Mg field for the past five years, with a focus on alloy design, experimental set-up and bio-corrosion properties for a range of biocompatible Mg alloys.

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