
Preface

In today's dynamic environment where we face immense challenges including reducing carbon footprint and improving sustainability, magnesium alloys are recognized as a viable alternative to iron- and aluminum-based alloys as well as structural polymers. This is due in part to the low density of magnesium, making it the lightest of all metals used for practical applications, as well as a number of other remarkable properties such as excellent vibration damping, electromagnetic shielding, and low toxicity. However, magnesium and its alloys have some shortcomings in the general areas of formability at low temperature, corrosion resistance, and high temperature applications. Therefore, there has been a quest by researchers, through a unique partnership between various industries, government agencies/laboratories, and academia, to drastically reduce the development time for new magnesium alloys and processes without adding development risks. Hence, this proceeding, which is the 18th annual volume of papers on all aspects of magnesium technology as well as basic research for industrialization, reflects the global synergistic efforts and advancements in the field of magnesium research. As in the previous years, the proceeding consists of papers from all the presenters in the Magnesium Technology symposium as well as the In-situ Methods for Unraveling Structure-Property Relationships in Light Metals symposium held during the 146th TMS Annual Meeting and Exhibition in San Diego, California, from February 26 to March 2, 2017. All papers in the following proceedings were peer reviewed by experts in the fields of magnesium and lightweight metals research as well as in methods for in situ testing.

During the annual meeting, the synergistic research effort was grouped into alloy development, solidification and processing, mechanical behavior (twinning, plasticity, texture, and fatigue), and finally, alloy degradation behavior. A special session on the role of rare earth elements on the deformation and formability of magnesium alloys was added to coincide with each of these topics. Overall, the present proceedings include contributions from 17 countries that were presented in 11 sessions including a plenary session and a unique poster pitches session. Additionally, the In-situ Methods for Unraveling Structure-Property Relationships in Light Metals symposium had 2 sessions.

The present proceeding also includes expert commentaries from renowned leaders in the magnesium fields on the future of magnesium technology, which were presented as keynote lectures. The several distinguished keynote speakers included Provost and Executive Vice Chancellor Prof. Enrique Lavernia, University of California, Irvine, who presented an overview on the "Multi-Scale Investigation on Yield 'Symmetry' and Reduced Strength Differential in an Mg-Y Alloy". This was followed by Dr. William Joost from the US Department of Energy on "Targeting High Impact R&D for Automotive Magnesium Alloys". Professor Alan Luo from the Ohio State University presented his thoughts on "Magnesium Development as a Lightweight Material—In Competition with Other Structural Materials". A historical perspective and future opportunity on the "The Continued Quest for Low-Temperature Formability in Mg Alloys" was laid out by Prof. Suveen Mathaudhu from the University of California, Riverside. Finally, Profs. Matthew Barnett (Deakin University) and Sean Agnew (University of Virginia) discussed the role of twinning and alloying elements on the mechanical behavior of magnesium alloys.

The specialty symposium In-situ Methods for Unraveling Structure-Property Relationships in Light Metals was organized by Wim Sillekens (European Space Agency) and Dmytro Orlov (Lund University). This symposium highlighted novel methods for the analysis of fabrication, service, and degradation of light metals along with state-of-the-art experiments in melt processing, solidification, and deformation mechanisms. There were 17 oral and 4 poster presentations including two keynote lectures “Ambient Pressure X-ray Photoelectron Spectroscopy in Light Element Materials Investigations” by Prof. Joachim Schnadt (Lund University and MAX IV synchrotron) and “Overview of In-Situ X-ray Studies of Light Alloy Solidification in Microgravity” by Prof. David Browne (University College Dublin).

Finally, the 2016–2017 Magnesium Committee is grateful and expresses appreciation to all authors for contributing to the success of the symposia, our panel of distinguished keynote speakers for sharing their valuable thoughts on the future of magnesium technology, the reviewers for their best efforts in reviewing the manuscripts, the session chairs, judges, TMS staff members, and other volunteers for their impeccable support.

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