

## Report on Asian Light Metals Association Forum 2014 (ALMA 2014)

The International Communication Committee (ICC) of the Japan Institute of Light Metals (JILM) held Asian Light Metals Association Forum 2014 (ALMA 2014) on November 14, 2014 at Koyamadai-Kaikan (Tokyo, Japan). The objective of this forum is to establish a network among researchers and engineers of light metals in Asia. The eminent presenters recommended from each region of Japan, Taiwan, Korea and Australia made valuable presentations on recent R&D activities, industrial trends and topics on light metals (Mg, Ti and Al alloys) in this forum. Regrettably, presentations from China were canceled as a matter of convenience, representative from China attended the forum.

The history of ALMA (former AFLM) started in 2006, when JILM started organizing International Communication Program (ICP) and held an Asian Symposium on light metals in Japan. Then, the member regions rotated the host region of both ICP meeting and AFLM. The host country was Japan in 2006 and 2012, Taiwan in 2007, Korea in 2008 and China in 2010. Since 2012, the forum has been held only in one day with only invited talks in a single session so as to make dense and open-minded discussions in a family-like atmosphere. In addition, AFLM was renamed to ALMA after last ICP meeting. The policy was explained by Prof. Kumai (Chairperson of ALMA) at the opening address.

The program of ALMA 2014 is shown as follows.

### **Session 1**

1. Kathie McGregor (The Commonwealth Scientific and Industrial Research Organisation, Australia), "Titanium Research in Australia"
2. Mitsuo Niinomi (Professor, Institute for Materials Research, Tohoku University, Japan), "Development of Titanium Alloys for Load Bearing Implant Devices through Focusing on Young's Modulus Control"

### **Session 2**

3. Kwang Seon Shin (Professor, Seoul National University, Korea), "Current R&D Activities on Magnesium Alloys in Korea"
4. Mark Easton (Professor, School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University, Australia) "Light Metals Research in Australia with foci on magnesium alloys and additive manufacturing"

### **Session 3**

5. Jian-Yih Wang (Professor, Department of Materials Science and Engineering, National Dong-Hwa University, Taiwan), "Mechanical Properties and Strengthening Behavior of Mg-Zn-MM Alloy"

6. Yoshihito Kawamura (Professor, Magnesium Research Center, Kumamoto University, Japan), "High Strength Magnesium Alloys Strengthened by a Novel LPSO Structure Phase"

### **Session 4**

7. Jun-Yen Uan (Professor, Department of Materials Science and Engineering, National Chung Hsing University, Taiwan) "Environmentally friendly conversion treatments of magnesium alloys -- taking examples of corrosion protection and scrap recycling"
8. Tadashi Aiura (Chief Engineer, Technical Control Dep. Kobe Steel Ltd., Japan) "Current light weighting technology of aluminum for automotive body structures"

Dr. McGregor explained the present status of titanium research in Australia. Research activities regarding processing the ore to metal powder and working with the metal were shown in the presentation. In addition, significant research effort devoted to exploring additive manufacturing was presented. Other areas of focus include alloy design and development etc. was summarized in the lecture.

Prof. Niinomi explained the design and development of titanium alloys for biomedical applications. A novel  $\beta$ -type titanium alloy (known as TNTZ) which comprising non-toxic and allergy free elements with a low Young's modulus was introduced in the lecture. In addition, a development of an alloy for spinal fixation devices which has a variable the Young's modulus attained by stress-induced transformation was presented in the lecture. There were many discussions during Q&A time, and growing interest in titanium research activities was proved in this session.

In sessions 2, 3 and 4, magnesium research and development activities were addressed by 5 lecturers.

Prof. Shin explained current R&D activities on magnesium alloy in Korea. A significant R&D project for magnesium alloys for super-light vehicles was launched by the Korean government, and recent topics of the project such as magnesium sheet development, high strength/ductility castings etc. were explained. The newest example explained in the lecture was a twin-roll cast magnesium sheet developed by Renault Samsung Motors and POSCO which installed in a brand-new vehicle released in 2014.

Prof. Easton provided an overview of some of the magnesium alloy systems that have been investigated during this time, their strength and weakness, and shed light on the design of alloys with improved properties. Also brief introduction of additive manufacturing activity in Australia was addressed. A range of

activities are being undertaken with increasing focus on biomedical applications with interest in aerospace and defense, industrial and mining.

Prof. Wang explained a research activity of Mg-Zn-MM alloy in National Dong-Hwa University, Taiwan. The mechanical properties of Mg-Zn-MM ( $Mg_{97}Zn_1MM_2$ ) alloy was comparable to Mg-Zn-Y alloy. The strengthening mechanism was also explained in the lecture: Mg-Zn-MM alloy is dispersion hardening by a strong second phase while that of Mg-Zn-Y is precipitation strengthening by a long-period stacking ordered phase.

Prof. Kawamura explained a novel high-performance Mg-M-RE alloys which has been developed in Japan. The LPSO-type magnesium alloys, known as “KUMADAI Mg alloy”, produced by rapidly solidified powder metallurgy processing exhibits higher mechanical properties and corrosion resistance than that of produced by ingot metallurgy processing. Current statuses of ongoing two national projects were also explained in the lecture.

Prof. Uan explained a research activity in National Chung Hsing University, Taiwan with regard to exploring environmentally clean methods for improving the corrosion resistance of magnesium alloy, and for recycling waste magnesium alloy scrap into some multi-functional materials. Chemical conversion treatment was performed to produce a Mg,Al-hydroxalite layer and/or calcium carbonate layer on magnesium alloy for corrosion protection. A catalyst-free method of producing  $H_2$  by mixing magnesium scrap in an aqueous citric acid was also explained in the presentation.

In sessions 2, 3 and 4, most five lectures were addressed regarding research and development activities in magnesium alloys. Discussions were also quite active, and greater expectations for magnesium R&D were realized.

Last lecture was addressed by Dr. Aiura with regard to light-weighting technologies on aluminum alloys for automotive body structures. Applications of aluminum products to closure panels, joining between aluminum and steel, forming technology etc. were explained. Furthermore, future trend on light weighting according to trends of recent models of automobiles was explained in the lecture.

This forum was a precious occasion to listen to dense lectures among wide variety of light metal topics; aluminum, magnesium, titanium and their alloys in one day.

Taking advantage of this opportunity, ALMA meeting was also held during lunch break. Delegations from each country discussed about the ALMA web page (<http://www.jilm.or.jp/alma/>) and its utilization.

At the end of the forum, Dr. Tsuchida (ICC chairperson) gave a memorial plaque to each lecturer, and Dr. Aiura (vice-chair) addressed the closing remarks.

Then a buffet party was held at Koyamadai-Kaikan. The party was so family-like with a small group that all of the participants communicated each other.

The next ALMA forum will be held in 2016 in Tokyo-metropolitan area in the occasion of JILM fall meeting.



Photo 1 Representatives from member regions, Prof. Kumai (Chairperson) and ICC members.



Photo 2 Opening address by Prof. Kumai.



Photo 3 Lecture by Dr. McGregor