

## Report on Asian Forum on Light Metals AFLM2012

The International Communication Committee (ICC) of the Japan Institute of Light Metals (JILM) held Asian Forum on Light Metals 2012 (AFLM 2012) on November 9, 2012 at Chiba Institute of Technology (Tsudanuma Campus, Chiba, Japan). The objective of this forum is to establish a network among researchers and engineers of light metals in Asia. The eminent presenters (Fig.1) recommended from each region of Japan, Taiwan, Korea, China and Australia made valuable presentations on recent academic and industrial trends and topics on light metals (Al, Mg, Ti and their alloys) in this forum.

The history of 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, Taiwan in 2007, Korea in 2008 and China in 2010. The AFLM became more gracious each time by the effort of the host regions. On the other hand, review of the original objectives of AFLM became necessary. The ICC members of JILM discussed the style of AFLM in order to make the international communication activities fruitful in the occasion of the start of the second round of the host regions. As a result, the ICC proposed that a forum will be held only in one day with only invited talks in a single session so as to make dense and frank discussions in a family-like atmosphere. The policy was supported by all representatives of the host regions and explained by Prof. S.Kumai (Chairman of AFLM 2012 and ICC Chair Person) at the opening address.

The program of AFLM 2012 is shown as follows.

### **Morning session, "Recent activity on light metals"**

1. Goroh Itoh (Professor, Ibaraki University, Japan), "Research and development in light metals in Japan ---Process, Microstructure, Properties---"
2. Shuo-Hua Shih (Vice President, Ningbo Huayang Aluminium-Tech Co, Ltd., Taiwan), "Market Outlook of Taiwan's Aluminium Industries"
3. Xujun Mi (Professor and Director, State Key Lab. of Nonferrous Metals and Processes, GRINM, China), "Recent Activity on Light Metals in China"
4. Yuri Estrin (Professor and Director, Centre for Advanced Hybrid Materials, School of Materials Science and Engineering, Monash University, Australia) "Improving the property 'portfolio' of Mg alloys by a new integrated processing technique"

### **Afternoon session, "Recent topics on light metals"**

5. Hiroyuki Toda (Professor, Toyohashi University of Technology,

Japan), "Time-resolved 3D measurements of mechanical behaviours in aluminium alloys"

6. Ching-Tang Chang (Vice President, AmLi Materials Technology Co., LTD., Taiwan), "The mechanical properties and applications of Magnesium-Lithium alloys"

7. Yong Tai Lee (Director of Light Metal Division, Korea Institute of Materials Science, Korea) "Current R&D Status on Ti Alloys in Korea"

8. Qiang Zhu (Professor and Vice Chief Engineer, GRINM, China) "Semi-solid processing of aluminium alloys in GRINM"

9. Mingxing Zhang (Associate Professor, School of Engineering, University of Queensland; Chief Investigator, ARC Centre of Excellence for Design in Light Metals, Australia) "Recent Research Progress in Grain Refinement for Cast Light Metals".

Prof. G. Itoh explained the trend of research and development of light metals by showing the outline and results of Japanese large national projects "Materials Science on Synchronized LPSO Structure — Innovative Development to Next-generation Lightweight-structural Materials (JSPS)", "Fabrication of novel nano-hetero structure aluminum alloys by utilizing iron and 3D structural analyses (JST)", and "Technology development in hydrogen production, transportation and storage system : Research and development in elemental technology in hydrogen station (NEDO)". A researcher from other region praised Japanese researchers, who actively gained research fund for structural materials and promoted R&D.

Mr.S.-H.Shih explained the market prediction of aluminum industry in Taiwan. He explained that Taiwan should emphasize advanced aluminum material, which is a specialty of Taiwan, to compete with rapidly growing nations, such as China and India.

Prof.X.J.Mi explained the industrial trend of Al, Mg and Ti in China. He introduced development of original Ti alloys for improvement of strength and heat proof properties. The amount of both import and export of Ti to China is increasing. China is importing mainly tubes, sheets and strips finished with high precision.

Prof.Y. Estrin explained the research on ultra fine-grained light metals by severe plastic deformation at Monash University (Fig.3). The results of Equal-channel Angular Pressing (ECAP) enabled us to strengthen pure Ti to the similar level of Ti6Al4V. Bio-compatible Ti material can be produced without toxic elements through this method. Integrated extrusion and ECAP were introduced as a method for improvement of the performance of

magnesium alloy ZK60 and the mass production of the alloy. Application of ECAP to mass production attracted the audience and was actively discussed.

Prof. H.Toda explained the research results on the mechanical behavior of aluminum alloys by X-ray tomography using radiation facility. This method was introduced to be an effective tool to visualize the micro-crack propagation and crystal orientation in 3D and 4D from local strain distribution obtained through 3D of CT. The application of this method to other materials was introduced with an example of application to ferrous alloys.

Mr.C.-T.Chang explained improvement of strength and corrosion resistance of Mg-Li and Mg-Al-Li alloys, which have extra-low density and excellent formability. He introduced that the strength and elongation can be improved by thermal-mechanical treatments, and the corrosion resistance can be improved by micro arc oxidization (MAO).

Dr.Y.T.Lee explained the research and development of application of Ti in Korea, such as the examples of applications to aerospace, defense, medical and bio engineering, energy industry, and refinement and processing of Ti.

Prof.Q.Zhu explained the research and development of semi-solid forming at GRINM, which is the largest institute for non-ferrous metals in China. The importance of precise control of the process parameters, such as temperature, was emphasized. The examples of the results showed that an annular EMS and a cooler in the center of the EMS effective for refinement of primary Si in Al-Si alloy.

Dr.M.X.Zhang explained the newest research results of mechanism for grain refinement of cast materials from the points of views of peritectic reaction, Q-factor and heterogeneous nucleation. The strategy to find the most effective refiner was suggested.

Prof.S.Kumai presented a memorial plaque to each speaker. This forum was such a precious occasion to listen to dense lectures that the conference site was full of audience. We were able to listen to the all of the lectures on aluminum, magnesium, titanium and their alloys because of the single session. The researchers and engineers of aluminum, magnesium and titanium usually have common problems and were able to exchange information each other.

Prof.T.Shibayanagi (vice-chair) emphasized at the closing remarks that this forum should aim at the number one of light metals after 20 or 50 years.

Then a buffet party was held in the campus of Chiba Institute of Technology. The party was so family-like with a small group that all of the participants communicated each other.

The next ALMA forum (renamed from AFLM) will be held in 2014 in Tokyo in the occasion of JILM fall meeting.



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



Photo 2 Opening address by Prof.S.Kumai and conference site.

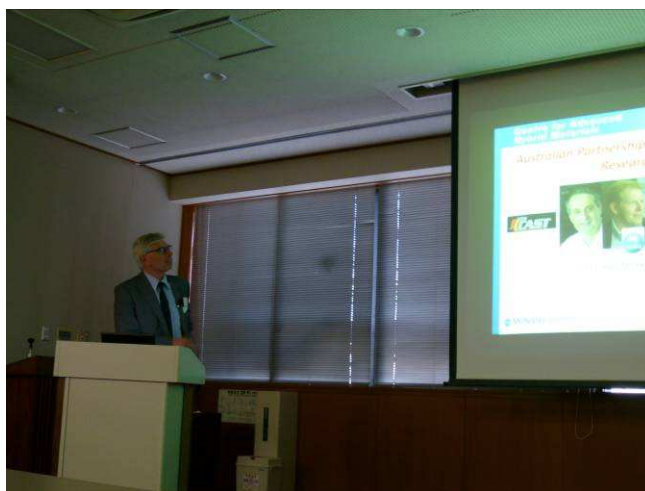


Photo 3 Lecture by Prof.Y.Estrin