

INTERNATIONAL CONFERENCE ON ALUMINUM ALLOYS ICAA12

RESUME OF ICAA12

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The twelfth regular international conference on aluminum alloys ICAA12 took place in Yokohama, Japan, on September 5 – 9, 2010. The conference is conducted once in two years and is the largest and well-established world forum for specialists in the field of aluminum alloys. In 2010 it was attended by about 500 participants representing producer companies, universities, and research institutes from many countries.

The organizer was the Japan Institute of Light Alloys headed by Professor T. Sato.

Aluminum-base alloys are leading structural materials. Their wide and diverse use is explainable by the unique combination of the main operating characteristics (strength, ductility, fracture toughness, corrosion resistance, conductivity, etc.), on the one hand, and the low density as compared to steels and copper alloys, on the other hand, to say nothing of the good adaptability of semiproducts and parts to manufacture. In addition, aluminum is the third element according to its occurrence in the earth crust (exceeding, for example, the occurrence of copper by a factor of 800). Today the volume of its production and consumption is the highest among non-ferrous metals. The world production of aluminum alloys grows continuously primarily due to the demand for deformable semiproducts and castings. In the nearest 1 – 2 years the world output of primary aluminum is expected to reach 30 million tons. According to the data of Japanese companies the total production of deformable semiproducts (rolled and pressed) from aluminum alloys in Japan is close to 3.5 million tons. By the data of Chinese producers the output of deformable (chiefly rolled) semiproducts in China has reached 5 million tons. However, the production of primary aluminum exceeds substantially the production of semiproducts from it.

Among the about 450 reports presented at the Conference a considerable part (about 40%) was made by partici-

pants from Japan as the organizer country. Other eastern and south-eastern Asian countries (China, Korea, India, Thailand, Taiwan) were also represented quite widely.

Australia, which is an established center of metals science, took part in many (25) reports devoted primarily to structural studies of decomposition of aluminum solid solution depending on the composition of the alloy, the processes of heat treatment, and the kind of production. Such works are primarily carried out by universities. We should also note the increased activity of Norwegian researchers, who participated in 30 reports devoted to various topics, the technologies and alloys of series 6XXX for transport facilities in the first turn. A number of reports were traditionally made by specialists of the leading American company ALCOA and were devoted, in particular, to practical problems of the aerospace industry. Reports were also presented by specialists from Great Britain, Canada, Italy, Netherlands, and other countries.

The twelve Russian participants in ICAA12 represented the Moscow Institute of Steel and Alloys (NITU "MISiS": N. A. Belov, A. N. Alabin, P. Yu. Bryantsev, and V. V. Cheverikin), the All-Russia Institute for Aircraft Materials (FGUP VIAM: V. V. Antipov, R. O. Vakhromov, and E. A. Lukina), the Baikov Institute for Metallurgy and Materials Science of the Russian Academy of Sciences (IMET RAN: V. F. Shamray), and the Belgorod University (R. O. Kaibyshev, I. A. Nikulin, A. A. Mogucheva, and A. Yu. Kipelova). Reports were also delivered by Russian specialists now working in foreign countries, i.e., D. G. Eskin (the Materials Innovation Institute, Delft, Netherlands; today the Brunel University, Great Britain) and S. Komarov (the Nippon Light Metal Company, Japan).

The representatives of Russia delivered 17 reports based on recent data.

It should be noted that many reports at ICAA12 presented a joint effort of specialists of different organizations (enterprises, institutes, universities) within one or several countries, universities in the first turn.

In this connection we should mention abstention of the largest Russian aluminum company OK RUSAL from participation in ICAA (including the last conference). Though early in 2008 the Company announced support of innovations in the form of contests on the use of aluminum, the program has been abandoned because of the crisis of economy. One of the three winners of the first contest ("Use of Aluminum in Transport") was the project "High-Tech Thermally Stable Deformable Aluminum Alloy of the Al-Cu-Mn-Zr system" (N. A. Belov and A. N. Alabin, MISiS). However, OK RUSAL participates in the Foundation for Promoting Domestic Science. In 2005-2007 a grant of this Foundation was won by a prominent scientist of the Russian Academy of Sciences I. N. Fridlyander.

On the whole, the world tendency of growing demand for deformable semiproducts and shaped castings from aluminum alloys in transport mechanical engineering (in the automotive industry in the first turn, in the production of high-speed trains) as well as in building, architecture, packaging, etc. and the specific structure of the industry of Japan has determined the fact that most reports at the conference were devoted to development of medium- and low-strength alloys of the Al-Mg-Si (series 6XXX), Al-Mg (series 5XXX), and Al-Mn (series 3XXX) systems, their production and application. Here we should mention developments in the field of foam aluminum.

A noticeable and important part of reports was devoted to fundamental research and applied studies for aircraft engineering and special purposes (about 30 reports concerning high-strength alloys of the Al-Zn-Mg-Cu system of series 7XXX and Al-Li alloys with reduced density).

Another considerable portion of reports covered the topic of casting (in particular, simulation and optimization of the processes of crystallization, formation of hot and cold cracks and pores, modification of the structure of castings and ingots, analysis of phase composition of multicomponent alloys). The total number of reports in Section "Casting" was the greatest in the history of ICAA (over 50). The interest in alloys with zirconium and scandium additives remains stable. The number of reports on aluminum-matrix composites has grown. The earlier popular topic of "Superplasticity" found reflection in only four reports, though the aspects connected with pressure treatment have been covered quite widely in Section "Forming."

The information on the tendencies of development of the aluminum industry, research and engineering advances in the field of aluminum alloys should be allowed for in development of the economy of the Russian Federation. The present special issue of the MSHT journal presents papers generalizing the materials of Russian specialists presented at the Con-

ference. This should make it possible to estimate the level of research in the field of aluminum alloys performed in the RF.

Russia produces over 15% of primary aluminum in the world and has many skilled scientists actively working in the field of aluminum alloys. Most of them belong to the traditional schools created in the USSR at the leading institutes and universities.

It should be noted that the studies of aluminum alloys performed in the RF not only match the world tendencies in the field but even lead them at some positions. Specifically, this can be said about the MISiS project of "Development and Installation of Innovation Casting Processes and Materials Based on Aluminum and Magnesium and Implementation of Programs of Technological Advancement of Casting Productions at Enterprises of the Base Industries (Aircraft and Automotive Industries and Cable Production in Particular)," which is carried out at the Department of the Casting Processes Technology.

FGUP VIAM has been and still remains the main developer and coordinator of the production of aluminum alloys for the aerospace industry and special-purpose engineering. The Institute is the author of virtually any domestic structural alloy and coauthor of the documentation for delivery and application. Its alloys are frequently used in other branches of industry. The scientific school created by Academician I. N. Fridlyander in the field of aluminum alloys has been preserved and develops. Fridlyander has devoted over 70 years to this work and had close relations with the metallurgical and aerospace industries, because the properties of semiproducts and parts depend considerably on the production process.

Summarizing the results of the last Conference we should mention the history of the ICAA. The first conference took part in the USA in 1988, the second in China in 1990, the third in Norway in 1992 and the fourth again in the USA in 1994. Since that time it has acquired a status of the leading world event in the field of aluminum alloys and was carried out in the cities of Grenoble (France, ICAA5, 1996), Toyohashi (ICAA6, Japan 1998), Charlottesville (USA, ICAA7, 2000), Cambridge (Great Britain, ICAA8, 2002), Brisbane (Australia, ICAA9, 2004), Vancouver (Canada, ICAA10, 2006), Aachen (Germany, ICAA11, 2008), and Yokohama (ICAA12, 2010).

The place for conducting the conference is chosen by the Organizational Committee in accordance with a number of criteria. In particular, ICAA have always taken place in countries with developed aluminum industry having many enterprises producing and consuming aluminum alloys, many research groups at universities and institutes. This generates a continuous need for innovations and stimulates applied and fundamental research.

The organizers have to provide a high level of accommodation of participants and of conduction of the conference, which requires appropriate infrastructure and sponsoring (from industrial companies of the country and research foundations).

ICAA conferences have always been held in the countries that have a representative in the International Organizational Committee. Today it consists of 11 members from 10 countries; one of them represents a country where the ICAA has not taken place (India). For a long time (1994 – 2009) Russia has been represented by Academician I. N. Fridlyander but today the Organizational Committee has no member from Russia.

The next conference ICAA13 will be held in 2012 in Pittsburgh (USA), the place of residence of the largest American aluminum company ALCOA that possesses two metal-

lurgical plants in Russia, i.e., “Alcoa SMZ” (Samara) and “Alcoa Metallurg Rus” (Belaya Kalitva).

It seems expedient to organize an ICAA conference in Russia, which has all grounds and prerequisites for the event. This would stimulate research of Russian scientists in the field of aluminum alloys and promote creation of an effective world-level structure of their consumption in Russia.

An organizational committee for such a conferences should be formed with support of the Ministry of Industry and Trade of the RF.