THIRD MEETING OF METAL SCIENTISTS OF RUSSIA

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The meeting held on September 24 – 27, 1996 in Ryazan was organized by the Association of Metal Scientists of Russia (RASMET), the Russian Engineering Academy, N. É. Bauman Moscow State Engineering University, the Moscow Automobile and Highway Institute (Engineering University), the Tyazhpressmash Joint-Stock Company (Ryazan), and the Ryazan Scientific and Engineering Information Center. The meeting was dedicated to the memory of Yurii Mikhailovich Lakhtin, the Honorable President of the Association of Metal Scientists of Russia, an Honored Scientist and Engineer of Russia, and a Doctor of Engineering.

The meeting was held at the Ryazan Scientific and Engineering Information Center and was reported by local radio and television.

The meeting was attended by over 60 representatives of higher institutions, academic research institutes, and industrial enterprises of Russia from 18 cities. The participants heard to 35 reports and 15 communications.

The agenda included a plenary meeting devoted to the memory of Yu. A. Lakhtin, reports of participants, an open meeting of the Board of the Association of Metal Scientists of Russia with the participation of the editorial board of the journal "Metals Science and Heat Treatment," and a meeting of the Engineering Commission on Quenching Cooling.

The meeting was opened by the President of the Association of Metal Scientists of Russia B. A. Prusakov. Then Natal'ya Érnestovna Struve, the closest coworker of Yu. M. Lakhtin, who worked with him for over 30 years, reviewed his achievements and presented interesting new facts about his life, illustrating her report by a large number of photographs.

The participants were informed of the decision of the 10th Congress of the International Society on Heat Treatment and Surface Engineering (ISHT) to present a memorial lecture dedicated to Yu. M. Lakhtin at the next congress.

All the reports presented in the plenary and other meetings contained interesting information on various problems of metals science and processes of heat treatment and chemical heat treatment of metallic materials. Some quite novel data were presented. Some of the reports will be published in upcoming issues of MSHT.

1. A geometric model of fullerene metallic complexes and a crystal structure based on them has been suggested. A geometric structural relationship has been shown to exist between fullerene-based crystals and so-called quasicrystals with a forbidden fivefold symmetry. As a rule, these are intermetallic compounds in aluminum- or titanium-based alloys with metals of the iron group. In accordance with the suggested concept both fullerenes and quasicrystals are a realization of the earlier principle of characterizing the structure of a substance by a nonuniform distribution of atoms in space. Such materials have their own structural porosity. It can be assumed that this principle will become a basis for the creation of new materials of the 21st Century (V. S. Kraposhin, "A new form of carbon: fullerene C_{60}, fullerene metallic complexes and metallic materials based on them").

2. Multicomponent ($K \geq 3$) phase diagrams have been plotted and the concept of pseudoeutectic structures formed by a diffusion-crystallization mechanism in boronizing has been introduced, which increase the plasticity, microhardness, and wear resistance of the boronized layers (M. G. Krukovich, "The theory and practice of boronizing").

3. A new model of the nitrogen potential of a furnace atmosphere has been suggested that involves terminology that reflects correctly the notion of the potential. A method for controlling the nitrogen-saturating capacity of the furnace atmosphere and the requisite diagnostic equipment have been developed, which has made it possible to create a new technological process of low-temperature chemical heat treatment characterized by elevated reliability relative to existing analogs (V. M. Zinchenko and V. Ya. Syropyatov, "A new method of low-temperature chemical heat treatment").

4. "White spots and reserves" of carburizing and nitriding processes conducted under industrial conditions have been revealed. It has been shown that under industrial conditions each process combines carbon-, nitrogen- and oxygen-charging of the parts, which can result in a multi-variant final structure of the surface layers in the carburized and cyanided parts, namely, they can differ in the proportion of the structural components (martensite, retained austenite, carbides, carbonitrides, nitrides) and the appearance of microstructural defects (nonmartensite components, internal oxidation, decarburization of the solid solution, dark inclusions). All these factors cause considerable variability of the properties of the parts (V. M. Zinchenko, "Technological principles of control over the phase composition and microstructure of the surface layers of parts saturated with carbon and nitrogen").

5. A method of hot plastic deformation of high-strength cast iron has been suggested that makes it possible to fabricate various metallic parts with a wide variety and range of mechanical properties including high ductility, strength, wear

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resistance, damping capacity, and other characteristics for a certain level of the initial structural state given that certain deformation conditions are observed (G. V. Sherbedinskii, "Manufacturing metal parts (sheet, rod, pipe, wire) from cast iron by the method of hot plastic deformation").

6. Based on an analysis of the Rakhshtadt-Bur'kov paradox a new approachto the creation of the structure of elastic components subjected to preliminary treatment for low bainite has been developed . The work was stimulated by the need for a structure insensitive to the effect of hydrogen and at the same time providing a high elasticity and an elevated toughness. The structure would make it unnecessary to dehydrogenate and control for failures and residual deformations such parts as spring washers. Such a structure can be created using a two-stage isothermal treatment (V. M. Chernov, "White spots' of the Rakhshtadt-Bur'kov paradox" and "Isothermal treatment of spring washers").

7. It has been shown that mechanical tests for studying slow fracture should be conducted under strictly specified conditions of the ambient and especially of the moisture content of the air. Otherwise, tests of the same material (for example, maraging steel) can result in a 1.5 – 2-fold scattering of the mechanical properties. A mechanism of embrittlement of grain boundaries in air tests has been suggested (V. V. Zabil'skii and V. V. Velichko, "Embrittlement mechanism of grain boundaries in the process of slow fracture of maraging steels tested in air").

8. Based on the results of the meeting of the Engineering Commission on Quenching Cooling of RASMET and the reports of A. G. Ksenofontov (N. É. Bauman Moscow State Engineering University), S. L. Tsukrov and V. I. Komov (All-Russia Institute of Light Alloys, Moscow), G. F. Feoktistova (Tyazhpressmash Joint-Stock Company, Ryazan), P. V. Sosnovskii (NIITavtoprom Joint-Stock Company, Moscow), V. V. Goryushin ("Moskovskii Podshipnik" Joint-Stock Company, Moscow), N. B. Potapova (FERROBALT Joint-Stock Company, St. Petersburg) the meeting approved the activities of the Commission aimed at creating standards and equipment for evaluating the cooling capacity of quenching media, preparing and publishing information on quenching media and their properties, and conducting works on utilizing quenching media for heat treatment of various articles (rails, plates made of aluminum alloys, etc.).

9. The role of phase analysis in research on and investigation of causes of failure has been shown again in the reports of G. D. Pigrova (Polzunov NPO TsKTI Company, St. Petersburg) "Phase analysis of materials for steam and gas turbines" and L. V Tarasenko (All-Russia Institute of Aircraft Materials, Moscow) "Phase composition and properties of high-temperature steels with coatings of B, B – Al, Cr – B."

10. The successful work of the young scientists M. Yu. Semenov (N. É. Bauman State Engineering University, Moscow), O. V. Silina and E. B. Syuzeva (State Engineering University, Perm), A. V. Ioffe (A. A. Baikov Institute of Metallurgy of the Russian Academy of Sciences, Moscow), V. I. Romadin (NPI of the NLMK Joint-Stock Company, Lipetsk) deserves special mention due to the good presentation and the high methodological and professional levels. This is evidence of the fruitful work of scientific schools in various parts of Russia.

The results presented above outline the material of the reports delivered at the conference. They could be widened considerably by analyzing the material published in the abstracts. In general, the Third Meeting of Metal Scientists of Russia was quite productive and gave considerable impulse to the development of metals science in the country.

RESOLUTIONS OF THE THIRD MEETING OF METAL SCIENTISTS OF RUSSIA

The meeting stated the following:

1. Since September 1994 the Association of Metal Scientists of Russia (RASMET) has gained wide recognition in Russia and in foreign countries for its successful research, organizational, and educational activities.

2. The principal results of the activity of the Association in Russia include:

– creation of the Moscow Association of Metal Scientists and its registration in Moscow as a noncommercial union;

– organization of branches of the Association in 44 regions of the Russian Federation;

– creation of the Engineering Commission on Quenching Cooling at the Association and its active work in Russia and abroad, including the organization and conducting of specialized seminars (Moscow, Zhavoronki, March 1995);

– regular (quarterly) meetings of the members of the Association with the honoring of outstanding Russian metal scientists;

– resumption of the traditional lectures dedicated to the memory of D. K. Chernov;

– organization of scientific and technological seminars independently and in cooperation with other scientific organizations and plants;

– publishing activities (the Moscow branch of RASMET is the founder of the MSHT journal; the monograph "New Materials and Technologies for Manufacturing Aircraft Parts" has been published).

3. The main results of the work of RASMET in foreign countries include:

– resumption of membership in the ISHT as a representative of Russia (25 September 1995, Isfagan, Iran) with observannce of all obligations, including payment of membership fees;

– participation in the work of the 10th Congress of the ISHT and the 25th Assembly of the Executive Committee on September 1 – 5, 1996 in Brighton, Great Britain (7 reports were delivered by a delegation of 3 members);

– participation in the work of the Second International Congress on Quenching Cooling on November 7 – 12, 1996 (Cleveland, USA); RASMET presented 13 reports and had

been elected a co-sponsor of the Congress; the President of RASMET was placed on the international jury of the Congress.

The meeting decided the following:

1. It approves the activities of the Association of Metal Scientists of Russia in the last two years and all the decisions made by the Bureau of the Association.

2. It considers it expedient to hold meetings of the Association and rotate the members of the Bureau once in two years (starting with 1996).

3. The next (fourth) Meeting of Metal Scientists of Russia should be held in 1998 (the time and place of the meeting will be established in the working agenda).

4. Branches of RASMET should be created in 46 regions of Russia, and the Association of Metal Scientists of Russia should be registered as a public organization at the Ministry of Justice of the Russian Federation.

5. The work of the MSHT journal should be approved; suggestions on improvement of the journal should be collected and considered at a meeting of the editorial board and taken into account in further issues.

6. The editorial board of MSHT should choose the most interesting reports delivered at the Third Meeting of Metal Scientists of Russia and issue them fully in a form revised for publication.

7. The possibility of resuming prizes in honor of D. K. Chernov and N. A. Minkevich should be considered with establishment of financing sources.

8. An Engineering Commission on mathematical modeling and computer software for heat treatment and surface engineering should be created.

9. It is expedient to join the newly created Asian Society of Metal Scientists as a representative of Russia and take part in its work in 1998 in Beijing (China).

10. It is expedient to take part in the work of the 2nd International Congress on Quenching Cooling on November 7 – 12, 1996 (Cleveland, USA).

11. In accordance with the decision of the ISHT the requisite materials should be prepared for the organization of a lecture in memory of Yu. M. Lakhtin at the next ISHT Congress (Florence, 1998) and be submitted to the Executive Committee of the ISHT in April 1997 (Bucharest, Rumania).

12. The Meeting approves the decisions of the Engineering Commission on Quenching Cooling.

The Engineering Commission on Quenching Cooling decided:

– to approve the plan of RASMET activities on creating a national standard of Russia for evaluating the cooling capacity of quenching media and the decision on participation in the ISO International Project for evaluating the cooling capacity of polymer solutions;

– to consider it necessary to create in Russia special diagnostic equipment for evaluating the cooling capacity of quenching liquids in a wide temperature range, especially in the region of martensite formation;

– to consider it expedient to create scientific and practical centers for investigating problems of quenching cooling and standardization of gauges in various regions of the Russian Federation (in the first stage in Moscow at N. É. Bauman Moscow State Engineering University and in Novokuznetsk);

– to recommend to interested regional branches and members of RASMET that they take part in the creation of standards and send their suggestions to the Engineering Commission on Quenching Cooling;

– to select the best polymer quenching media and to publish their list, technological parameters, and cost and the addresses of producers in MSHT;

– to generalize the collected suggestions, correct the plan for creating national and international standards, and discuss it at the 2nd seminar on problems of quenching cooling to be held in January-March 1997;

– to make to industrial enterprises interested in this work a suggestion to join it as sponsors and co-authors.

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