

Soviet and Japanese Aerospace Literature

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Soviet Aerospace Literature This month: *Metallic Materials*

A89-21716 Effect of temperature on the hardness of molybdenum-nickel P/M alloys (Vliianie temperatury na tverdosť spechennykh molibden-nikelevykh splavov). I. V. MIL'MAN, M. M. RISTICH, V. A. GONCHARUK, N. P. KORZHOVA, and I. V. GRIDNEVA, *Poroshkovaya Metallurgiya* (ISSN 0032-4795), Nov. 1988, pp. 85-89. 6 Refs.

The temperature dependence of the microhardness of Mo-Ni P/M alloys with 1-20 percent Ni by mass is investigated experimentally in the temperature range 20-900 C. The results obtained are consistent with the concept of Mo-Ni P/M alloys as dispersion-strengthened systems based on a molybdenum matrix with inclusions of rigid particles of the delta phase (MoNi intermetallic).

A89-19772 Effect of heat and mass transfer processes during the growth of aluminum alloy shapes on their geometry and structure (Vliianie teplo- i massobmennyykh protsessov pri vyrashchivanii profilirovannykh izdelii iz alluminievyykh splavov na ikh geometrii i strukturu). B. N. KORCHUNOV, A. S. KOSTYGOV, V. V. PELLER, G. G. KHOKHLOV, and V. N. OSIPOV, *Akademiia Nauk SSSR, Izvestiia, Seriya Fizicheskaya* (ISSN 0367-6765), Vol. 52, Oct. 1988, p. 2045-2053. 12 Refs.

Experimental data are presented on the effect of the characteristics of heat and mass transfer on the geometry and structure of Stepanov-grown shapes of aluminum alloys. Ways of controlling the geometry and structure of the Stepanov-grown shapes are discussed with reference to results obtained for pipes and shapes of D16 and AMts aluminum alloys. In particular, attention is given to the internal cooling of closed profiles, control of the wall thickness of grown shapes by proportioned cooling, and controlled forced mass transfer in a melt column within the sizing opening of the shaper.

A89-21714 Characteristics of rolling texture evolution in thin sheets of a pseudo-alpha Ti-Al-V alloy (Ob osobennostiakh razvitiia tekstur prokatki v tonkikh listakh psevdo-al'fa-spiava titana sistemy Ti-Al-V). A. A. BABAREKO, I. V. EGIZ, and O. S. BELOVA, *Metallovedenie i Termicheskaya Obrabotka Metallov* (ISSN 0026-0819), no. 11, 1988, pp. 49-52. 5 Refs.

Experiments have been carried out to investigate texture distribution over the thickness (2 mm) of rolled sheets of a pseudo-alpha Ti-Al-V alloy (6 pct Al and 4 pct V) with a low content of beta stabilizers. It is found that texture distribution over the thickness of the sheets is nonuniform. A shear texture associated with basis and prismatic slip is shown to dominate in layers close to the surface, whereas a plane strain structure with the initial prismatic orientation of the alpha phase dominates in the center of the sheets.

A89-21713 Evaluation of the deformability of titanium alloys (Ob otsenke deformiruemosti titanovykh splavov). I. N. KAGANOVICH, *Metallovedenie i Termicheskaya Obrabotka Metallov* (ISSN 0026-0819), no. 11, 1988, pp. 47-49. 5 Refs.

The deformability of titanium alloys is investigated as a function of their structure and composition. It is shown that the deformability of titanium alloys is largely determined by the level of alpha phase alloying and by the phase composition. A classification based on deformability is proposed whereby titanium alloys are classified into the following three groups: (1) alloys with satisfactory deformability, such as VT-0, VT1-00, VT6, VT14, and VT15; (2) low-deformability alloys, such as VT5-1 and VT20; and (3) alloys with limited deformability, such as VT3-1, VT8, VT9, VT18, VT22, and VT25.

A89-21709 Dislocation substructure and mechanical properties of titanium deformed at different rates (Dislokatsionnaya substruktura i mekhanicheskie svoystva titana, deformirovannogo s razlichnymi skorstiami). A. R. SMIRNOV and V. A. MOSKALENKO, *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Vol. 66, Oct. 1988, pp. 799-807. 16 Refs.

The effect of deformation rate on the formation of rotational and translational substructures in polycrystalline titanium VT1-00 is investigated by statistically processing electron microscopy images of the metal structure. It is shown that, as the deformation rate decreases, the probability of the formation of rotational substructures increases and that of translational substructures decreases. The results of structural studies are compared with the mechanical properties of titanium.

A89-18837 Effect of chemical composition on the structure and mechanical properties of Mn-Al-C alloys in the magnetic region (Vliianie khimicheskogo sostava na strukturu i mekhanicheskie svoystva splavov sistemy Mn-Al-C v magnitnoi oblasti). O. A. KAIBY-SHEV, R. Z. VALIEV, A. KH. NURISLAMOV, and V. V. STOLIAROV, *Metallovedenie i Termicheskaya Obrabotka Metallov* (ISSN 0026-0819), no. 10, 1988, pp. 52-54. 7 Refs.

The thermal stability and deformability of Mn-Al-C alloys containing 0.6 pct C are investigated experimentally as a function of excess phase content. It is shown that an increase in Mn content from 68.9 to 73.5 pct leads to increased stability of the high-temperature epsilon phase. The enrichment of the system Mn-Al-Cu in Mn and Al above the optimum composition leads to the formation of nonmagnetic excess phases, eta and beta, which reduce the magnetization of the alloy. In addition, a decrease in thermal stability is observed in the alloy with 73.5 pct Mn due to the decomposition of the ferromagnetic phase.

A89-21597 Elastic-plastic properties of AMg6M aluminum alloy at high deformation rates (Uprugoplasticheskie svoystva alluminievogo splava AMg6M pri vysokikh skorostnykh deformatsii). A. M. BRAGOV and A. K. LOMUNOV. *PMTF—Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki* (ISSN 0044-4626), Sept.-Oct. 1988, pp. 168-171. 15 Refs.

Experimental data are presented on the behavior of AMg6M alloy at deformation rates of 1000/s. It is found that the deformation rate has a significant effect on the mechanical properties of the alloy. In experiments with dynamic cyclic loading, the elastic characteristics are found to be independent of the deformation history.

A89-21559 Forming of multilayer titanium panels in the superplastic state (Formirovaniye mnogosloynnykh titanovykh paneli v sostoyanii sverkhplastichnosti). N. M. BIRIUKOV and V. A. SMIRNOV. *Aviatsionnaya Tekhnika* (ISSN 0579-2975), no. 3, 1988, pp. 38-42.

A process for the forming of the sides and edges of multilayer titanium panels is described which combines superplastic forming and diffusion welding. Analytical expressions are obtained for determining the optimum process parameters and acceptable geometrical ratios of the multilayer panels. The analysis presented here provides initial information for the development of automatic control systems for the production of multilayer panels.

A89-21518 Motion characteristics and mechanisms of crystalline inclusions in dispersion-hardened alloys (Zakonomernosti i mekhanizmy dvizheniya kristallicheskikh vklucheniy v dispersno-uprochnennykh splavakh). I. U. R. KOLOBOV, L. A. MARVINA, and B. N. BABICH. *Akademika Nauk SSSR, Doklady* (ISSN 0002-3264), Vol. 30, no. 6, 1988, pp. 1364-1367. 10 Refs.

The combined migration of grain boundaries and crystalline oxide inclusions in polygonized Ni-3 pct HfO₂ and Ni-3 pct ZrO₂ during crystallization annealing at 1623 K is investigated by optical metallography and electron microscopy. It is found that the migration kinetics of grain boundaries with particles is adequately described by known models allowing for particle accumulation and coalescence at grain boundaries. The motion mechanism and velocity of the crystalline particles depend to a great extent on the content of surfactant impurities in the alloy.

A89-21502 A study of the B2-R transformation in aged Ti-Ni-V and Ti-Ni alloys (Issledovanie prevrashcheniya B2 R v sostavnykh splavakh sistem Ti-Ni-V i Ti-Ni). A. G. KHUNDZHUA, M. I. ZAKHAROVA, and G. N. KOKOEV. *Metallofizika* (ISSN 0204-3580), Vol. 10, Nov.-Dec. 1988, p. 14-17. 8 Refs.

Changes in the crystal structure and martensite points during the isothermal aging of hardened Ti-Ni-V and Ti-Ni alloys are investigated experimentally using X-ray diffraction analysis. It is found that, at the early stages of B2 phase aging in Ti46Ni46V8, Ti60Ni46V4, and Ti(49.5)Ni(50.5) alloys, the temperature of the direct transition during cooling is higher than the temperature of the inverse transition under heating. Conditions leading to the shifting of the transition points in the first and subsequent transition titles are examined.

A89-18838 A study of structural inhomogeneities in amorphous materials based on an Ni-Nb alloy (Izuchenie strukturnykh neodnorodnostei v amorfnykh materialakh iz splava Ni-Nb). I. U. A. KUNITSKII, I. U. A. BESPALOV, and V. N. KORZHIK. *Poroshkovaya Metallurgiya* (ISSN 0032-4795), Oct. 1988, pp. 6-11. 16 Refs.

A study is made of the structure of specimens of an amorphous eutectic Ni-Nb alloy produced in the form of 200-micron-thick coatings and 20-micron-thick ribbons by plasma-arc spraying and by melt spinning, respectively. By using the optical Fourier analysis of electron microscopy images, some characteristic structural features of the amorphous alloys associated with differences in their production are identified.

A89-18836 Fatigue strength of VT23 titanium alloy in high-frequency testings (Soprotivleniye ustalosti titanovogo splava VT23 pri ispytaniyakh s vysokoi chastotoi nagruzheniya). L. E. MATOKHNIUK, A. V. VOINALOVICH, A. A. KHLIAPOV, S. G. BULGAKOVA, and V. P. ARTIUSHINA. *Metallovedenie i Termicheskaya Obrabotka Metallov* (ISSN 0026-0819), no. 10, 1988, pp. 46-48. 7 Refs.

Specimens of heat treated titanium alloy VT23 were tested in fatigue at loading frequencies ranging from 0.46 to 10 kHz. It is shown that the fatigue strength of the alloy increases monotonically as the loading frequency is increased from 0.46 to 10 kHz. The results of the study indicate that the low-frequency fatigue strength of the alloy can be determined from high-frequency test results. Details of the experimental procedure and test results are presented.

A89-18646 Development of structural inhomogeneity during alloy solidification (Razvitiye strukturnoi neodnorodnosti pri zatverdevanii splavov). V. V. SOBOLEV and P. M. TREFILOV. *Akademika Nauk SSSR, Izvestiya, Metally* (ISSN 0568-5303), Sept.-Oct. 1988, pp. 52-60. 19 Refs.

The solidification of a binary alloy of the diluted solution type with an impurity is investigated analytically for different interface configurations. The influence of kinetic effects reducing the impurity concentration is shown to increase with interface curvature in the case of a concave interface and to decrease in the case of a convex interface. Expressions describing conditions of transition to a cellular structure are obtained. The analytical results are found to be in good agreement with experimental data for ST3 steel.

A89-18676 A new alloy of the system Al-Mg-Li (Novyi splav sistemy Al-Mg-Li). I. N. FRIDLIANDER and V. S. SANDLER. *Akademika Nauk SSSR, Vestnik* (ISSN 0002-3442), no. 10, 1988, pp. 43-45.

The history of the development of alloy 1420 based on the system Al-Mg-Li is briefly reviewed, and the structure and physicochemical properties of alloy 1420 are discussed. The density of alloy 1420 is 11 percent lower than that of D16 duralumin (Al-Mg-Cu), and its modulus of elasticity is 4 percent higher than that of D16, with the strength characteristics of both alloy being practically the same. As a result, parts and components made of 1420 alloy are 10-15 percent lighter than similar parts and components of D16 alloy of equivalent strength.

A89-18654 Unsteady creep of metals at elevated temperatures and low stresses (Neustanovivshiesya pozuchest' metallov pri povyshennykh temperaturakh i ponizhennykh napryazheniyakh). A. A. VAKULENKO, I. U. A. DUSHIN, and N. A. MEDVEDEV. *Problemy Prochnosti* (ISSN 0556-171X), Oct. 1988, pp. 54-57. 5 Refs.

The creep behavior of metals is investigated for the case where the formation and growth of microvoids in the material cannot be neglected. A full system of rheological relations is obtained for describing the creep process in time. Calculations are carried out for specimens of KhN55MVs alloy in the stress range 0.25-0.005 of the ultimate tensile strength at 850, 900, and 950 C, and the results are compared with experimental data.

A89-18649 Statistical theory of microcrack nucleation (K statisticheskoi teorii zarozhdeniya mikrotreshchin). R. G. SHIN, V. L. KATKOV, and M. R. PAI. *Akademika Nauk SSSR, Izvestiya, Metally* (ISSN 0568-5303), Sept.-Oct. 1988, pp. 148-156. 20 Refs.

A statistical theory of microcrack nucleation is developed on the basis of a deformation approach to the concentrated nucleation and accumulation of microscopic defects. The principle of the multiplicity of stress-strain states that are statistically equivalent in terms of microcrack nucleation probability is formulated and verified experimentally. The theory developed here provides a way to predict the extent of damage sustained by polycrystalline materials during deformation.

A89-18648 Structural transformations in Kh24K15 alloys containing molybdenum and niobium (Strukturnyye prevrashcheniya v splavakh Kh24K15, legirovannykh molibdenom i niobiyem). L. B. VUL'F, G. P. DEMENT'EVA, A. E. KOLCHIN, N. V. MENUSHENKOVA, V. S. SHUBAKOV et al. *Akademika Nauk SSSR, Izvestiya, Metally* (ISSN 0568-5303), Sept.-Oct. 1988, pp. 115-118.

The addition of 1.5 pct Nb to Fe-24Cr-15Co alloys containing 4 and 8 pct Mo is shown to prevent the formation of the gamma phase in these alloys. In an alloy with 3 pct Mo, it also prevents the formation of the sigma phase. It is also shown that the presence of 1.5 pct Nb in Fe-24Cr-15Co alloys containing 3-6 pct Mo leads to the formation of the Laves phase of the MgNi₂ type, which noticeably inhibits grain growth in deformed specimens during subsequent isothermal holding without affecting their saturation magnetization and hardness.

A89-18647 Parameters of the hot isostatic pressing of porous materials (Parametry gorichnogo izostaticheskogo pressovaniya poristykh materialov). A. M. LAPTEV, V. N. SAMAROV, and S. V. PODLESNYI. *Akademika Nauk SSSR, Izvestiya, Metally* (ISSN 0568-5303), Sept.-Oct. 1988, pp. 92-98. 15 Refs.

A method for calculating the principal parameters of the hot isostatic pressing of powder materials is proposed which is based on the combined use of continuum and structural models of porous materials. The predictions of the model, which has been implemented on a computer, are found to be in good agreement with experimental data. The effect of HIP pressure and temperature on the time of full densification is examined with reference to experimental results obtained for copper, high-speed steel, and nickel alloy powders.

A89-18641 Analytical description of cyclic elastic-plastic deformation curves for structural materials (Analiticheskoe opisanie krivyykh tsiklicheskogo uprugoplasticheskogo deformirovaniya konstruktsionnykh materialov). I. V. PUCHKOV and I. U. M. TEMIS. *Problemy Prochnosti* (ISSN 0556-171X), Sept. 1988, pp. 18-22. 10 Refs.

Analytical expressions are proposed for describing cyclic elastic-plastic deformation curves for structural materials with allowance for changes in the elastic modulus, Bauschinger effect, and transformation scale of the nonlinear section of the deformation curve. The need for considering changes in the above parameters is demonstrated for the nickel-based alloy KhN73MBTyVD tested under cyclic elastic-plastic loading.

A89-18605 Structure and properties of B2 titanium compounds. I - Premartensitic phenomena (Struktura i svoystva B2-soedinenii titana. I - Predmartensitnyye yavleniya). V. G. PUSHIN, V. N. KHACHIN, V. V. KONDRATEV, S. A. MUSLOV, L. I. IURCHENKO et al. *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Vol. 66, Aug. 1988, pp. 350-356. 20 Refs.

Premartensitic phenomena in Ti-Ni, Ti-Ni-Fe, and Ti-Ni-Cu B2 compounds are investigated experimentally by a variety of techniques including X-ray and electron diffraction analyses and in situ electron microscopy. The real structure of B2 alloys and its evolution are determined. Premartensitic states are described in terms of near-range atomic orders and alternating intermediate shear structures localized within microdomains.

A89-18475 Effect of electron irradiation on the internal friction and elastic modulus of the plastically deformed amorphous alloy Ni₇₈Si₁₈B₁₄ (Viliane elektronnoho oblucheniia na vnutrennee trenie i modul' uprugosti plasticheski deformirovannogo amorfnogo splava Ni₇₈Si₁₈B₁₄). I. V. ZOLOTUKHIN, V. I. BELIAVSKII, V. A. KHONIK, I. A. SAFONOV, and T. N. RIABTSEVA, *Metallfizika* (ISSN 0204-3580), Vol. 10, Sept.-Oct. 1988, p.99,100. 8 Refs.

Experimental results are presented on the effect of 2-MeV electron irradiation on the internal friction and elasticity characteristics of 30-35-micron ribbons of Ni₇₈Si₁₈B₁₄ amorphous alloy produced by melt spinning techniques. Changes in the internal friction and elastic moduli of irradiated specimens and temperature dependences of these characteristics are shown in graphic form, and the results are interpreted in terms of dislocation mechanisms.

A89-18426 Characteristics of the phase composition of welded joints in the high-strength titanium alloy VT-9 (Osobennosti fazovogo sostava svarnykh soedinenii zharoprochnogo titanovogo splava VT-9). F. I. AZAMATOVA, N. N. GANZHULA, B. A. ZADERII, I. A. B. NUDEL'MAN, V. S. TATARCHUK et al., *Fizika i Khimiia Obrabotki Materialov* (ISSN 0015-3214), Sept.-Oct. 1988, pp. 95-98. 7 Refs.

The structural states of welds in high-temperature titanium alloy VT-9 are investigated by X-ray diffraction analysis. Titanium and zirconium silicides, (TiZr)₅Si₃, are detected in the heat affected zone, which has a negative effect on the properties of the welds, such as impact toughness and corrosion stability. Subsequent local heat treatment leads to the dissolution of silicides and improves the properties of the welds.

A89-16606 Structure and properties of B2 titanium compounds. II - Premartensitic instability of the bcc (B2) lattice (Struktura i svoistva B2-soedinenii titana. II - Predmartensitnaia neustoichivost' OTSK/B2/-reshetki). V. V. KONDRAT'EV, S. A. MUSLOV, V. G. PUSHIN, and V. N. KHACHIN, *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Vol. 66, Aug. 1988, pp. 359-369. 21 Refs.

The stability of the bcc (B2) lattice is analyzed with respect to homogeneous distortions and short-wave displacements of static waves. The elastic spinodal curve and instability thresholds of the initial bcc phase near the martensitic transformation temperature are determined for a NiTi alloy. It is shown that the variety of premartensitic structures and the homogeneous nature of their formation can be explained in terms of the specific elastic properties of these alloys and also in terms of the strong softening of the phonon branch of transverse lattice oscillations.

A89-16604 Carbide transformations in a gamma/gamma-prime nickel alloy during prolonged aging (Karbidnye prevrashcheniia v nikelovom gamma/gamma' splove pri dlitel'nom starenii). A. A. KOPYLOV, V. V. BOGAEVSKII, B. K. PISAREV, V. P. LESNIKOVA, V. A. KOPYLOVA et al., *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Vol. 66, Aug. 1988, pp. 313-317. 6 Refs.

Carbide reactions occurring in a precipitation-hardening gamma/gamma-prime Ni-Cr alloy during prolonged high-temperature aging are investigated experimentally. It is found that the decomposition of primary MC carbides, which is accompanied by the precipitation of M₂₃C₆ particles, may lead to void nucleation and growth. The effect of carbide transformations on the residual properties of the material at temperatures above the equilibrium temperature is observed at the late stages of aging only.

A89-16603 Hydrogen-induced shape memory effects and phase and structural transformations in Ti-Ni alloys (Effekty pamiati formy, fazovye i strukturnye prevrashcheniia, vyzvannye vodorodom v splyavakh sistema Ti-Ni). S. B. MASLENKOV, N. B. BUDIGINA, M. KH. SHORSHOROV, and I. U. M. FLOMENBLIT, *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Vol. 66, Aug. 1988, pp. 307-312. 13 Refs.

Shape memory effects and the associated structural transformations in electrochemically hydrogenated Ti-Ni alloys are investigated experimentally using X-ray diffraction analysis and dilatometry. It is shown that, under conditions of one-sided hydrogenation, structural transformations result from the formation of oriented martensite or from the orientation of the already existing martensite. Thermal cycling gives rise to the hydrogen-induced low-temperature reversible shape memory effect, which results from the reverse transformation or from the misorientation of the 'hydrogen' martensite.

A89-13285 Effect of alloying and heat treatment on phase transformations in TiNi-based alloys (Viliane legirovaniia i termicheskoi obrabotki na fazovye prevrashcheniia v splyavakh na osnove soedineniia Ti-Ni). V. M. ERMAKOV, V. I. KOLOMYTSEV, O. I. LESHCHINSKAIA, V. A. LOBODIUK, and R. I. A. MUSIENKO, *Metalllovedenie i Termicheskaiia Obrabotka Metallov* (ISSN 0026-0819), no. 9, 1988, pp. 61-64. 17 Refs.

The effect of alloying and heat treatment on the characteristic temperatures of phase transformations in TiNi-based alloys with Fe, Re, Ge, Nb, and Ni is investigated experimentally using electron microscopy, X-ray diffraction, and neutron diffraction analysis. It is shown that alloying with Fe, Re, Ge, and Nb lowers the temperature of the martensitic transformation, this effect increasing with the amount of the alloying element. It is also shown that heat treatment results in a broadening of the temperature range of phase transformations and leads to changes in their sequence.

A89-14823 Delayed fracture kinetics of the heat affected zone of a welded joint in a high-strength low-alloy steel (Kinetika zamedlennoho razrusheniia zony termicheskogo vilianiia svarnogo soedineniia nizkolegirovannoi vysokoprochnoi stali). V. V. VOLKOV and V. E. MIKHAILOV, *Akademika Nauk SSSR, Sibirskoe Otdelenie, Izvestiia, Seria Tekhnicheskii Nauki* (ISSN 0002-3434), Aug. 1988, pp. 101-107. 8 Refs.

The kinetics of delayed fracture in the heat affected zone of a weld under conditions of static loading in the presence of internal hydrogen is investigated metallographically using specimens of an HSLA steel, 14KhGMR, with a simulated heat affected zone structure. Some characteristics of the evolution of local plastic deformations in the plastic region ahead of the crack tip at the stage of steady state crack growth are examined. The mechanism of delayed fracture is described in detail, with the embrittling role of hydrogen taken into account.

A89-13284 Physical principles of small strain stabilization in precipitation-hardenable alloys (Fizicheskie osnovy stabilizatsii mal'kh deformatsii dispersionno-tverdeiu shchikh splyavov). L. E. ALEKSEEV, V. I. SARAK, N. V. RATOVA, and E. I. TALALAKINA, *Metalllovedenie i Termicheskaiia Obrabotka Metallov* (ISSN 0026-0819), no. 9, 1988, pp. 26-33.

The strain aging behavior of the precipitation-hardenable aluminum alloys D16 and V95 is investigated experimentally to determine the possibility of activating stress relaxation in order to increase the precision of low-strain die forging. It is found that small strain stabilization in D16 and V95 is largely determined by stress relaxation during the deformation-induced final decomposition of the solid solution. Strain aging following small deformations makes it possible to produce slightly curved die-forged parts with high precision.

A89-13283 Crack growth resistance of heavy extruded and rolled semifinished products of new aluminum alloys (Soprotivlenie razvitiu treshchin krupnogatitnykh pressovannykh i katanykh polufabrikatov iz novykh aluminievyykh splyavov). A. G. VOVNIANKO, L. A. BUKREEVA, and E. A. ZAKHARENKO, *Metalllovedenie i Termicheskaiia Obrabotka Metallov* (ISSN 0026-0819), no. 9, 1988, pp. 8-11. 5 Refs.

Experimental data are presented on crack propagation rates in extruded and rolled panels of new aluminum alloys 1161, 1163, and 1973 used in load-bearing wing structures. The results obtained for these alloys are compared with crack growth data for the traditional D16ch and V95pch alloys. It is shown that the fracture toughness of the new alloys is significantly higher than that of D16ch and V95pch, making it possible to increase the life of aircraft components and permissible loads while reducing the aircraft weight. It is also shown that the use of extruded instead of rolled panels makes it possible to increase nominal stresses.

A89-13282 Effect of grain size on the structural strength of the aluminum alloy AMg6 (Viliane razmera zerna na konstruktivnuu prochnost' aluminievogo splava AMg6). M. KH. RABINOVICH, V. G. KUDRIASHOV, and M. V. MARKUSHEV, *Metalllovedenie i Termicheskaiia Obrabotka Metallov* (ISSN 0026-0819), no. 8, 1988, pp. 42-44. 18 Refs.

The strength and ductile characteristics of AMg6 alloy are investigated experimentally as a function of its grain size. It is found that the longitudinal and transverse strength and ductility of the alloy, its transverse impact toughness, and the conditional stress intensity factor are practically independent of the grain size. An ultrafine-grained structure somewhat reduces the low-cycle fatigue life of AMg6 alloy while increasing its high-cycle fatigue life. The ultrafine-grained AMg6 alloy is isotropic with respect to fracture toughness, whereas the coarse-grained alloy is anisotropic.

A88-53978 Composition and structure of a hardened surface layer on aluminum alloys produced by microarc oxidation (Sostav i struktura uprochnennogo poverkhnostnogo sloia na splyavakh aluminia, poluchennogo pri mikrodogovom oksidirovani). V. A. FEDOROV, V. V. BELOZEROV, N. D. VELIKOSKAIKA, and S. I. BULYCHEV, *Fizika i Khimiia Obrabotki Materialov* (ISSN 0015-3214), July-Aug. 1988, pp. 92-97. 11 Refs.

Experimental results are presented on the phase composition and structure of a hardened surface layer produced by microarc oxidation on various commercial aluminum alloys, such as A99, AMg6, D16, V96, and A19. It is shown that the phase composition of the hardened layer depends on the chemical composition of the oxidized material and on the oxidation process variables. The results demonstrate the possibility of obtaining hardened layers with specified phase composition and structure, and consequently, with desired properties.

A88-53960 Effect of hydrogenation on the fatigue strength of PT-7M titanium alloy (Viliane navodrozheniia na soprotivlenie ustalosti titanovogo splava PT-7M). L. E. MATOKHNIUK, A. V. VOINALOVICH, T. I. IAKOVLEVA, and A. N. MIKISHEV, *Problemy Prochnosti* (ISSN 0556-171X), Aug. 1988, pp. 70-75. 14 Refs.

Experiments have been carried out to investigate the effect of a prolonged hydrogenating anneal producing a hydrogen concentration of 0.03 percent on the fatigue strength of PT-7M titanium alloy. It is found that the hydrogenating treatment increases the fatigue life of the alloy and lowers its sensitivity to stress concentration. An electron microscopy examination shows that the increased fatigue strength of the alloy results from the formation of vacancy clusters, which are eventually transformed to nongrowing microvoids.