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B013/B055

15.8500

AUTHORS: Ratner, S. B., Stinskas, A. V., Gil'gendorf, Yu. G.

TITLE: Mechanical Testing of Plastics. 3. Fatigue Tests

PERIODICAL: Plasticheskiye massy, 1960, No. 9, pp. 54 - 61

TEXT: The present investigation bases on a paper read by S.B.Ratner at the Conference on the Practical Use of Plastics in Building. This paper treated the physical characteristics of the mechanical properties of plastics and the specificity of their testing methods. Owing to the great interest taken in this subject, the lecture material for publication was supplemented and subdivided into five communications. The first two of these were published in 1960, in the numbers 7 and 8 of this journal. At the outset, the essential difference between the fatigue of plastics and the fatigue of metals is stressed. The present-day methods applied in fatigue tests are divided into two groups differing in type of index and design of testers. The tests in question are the tests of hard plastics and soft plastics. The methods and testing machines used for testing hard plastics are essentially the same as are used for metal testing

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(Figs.1 - 5, Table 1). The machine by De-Mattia, generally applied for testing rubber, is used for testing soft plastics in the form of thin, flexible sheets and films, etc. (Fig.6, Table 2), (Refs.15 and 16). Data obtained at the Fiziko-mekhanicheskaya laboratoriya NIIPM (Physico-mechanical Laboratory of the Scientific Research Institute of Plastics) permit the following conclusions to be drawn: The fatigue curve of plastics at harmonic stress usually has the shape of the curve according to Veler. The only difference is that it does not approach the horizontal asymptote, as is the case for most metals. This generally known conclusion also holds for the plastics investigated. Testing of hard plastics was carried out by means of the МУИ-6000 (MUI-6000) machine and, in collaboration with the TsNIITMASh (Central Scientific Research Institute of Technology and Machine Building), by means of a У-12 (U-12) machine. The fatigue coefficients K (the percentage of remaining strength σ relative to the static strength P) of glass-reinforced plastics and unfilled polymers vary widely. After 10^6 - 10^7 stress cycles the fatigue coefficient of unfilled plastics averages 10%, while for glass-reinforced plastics it lies around 20 - 35%. The approximate constancy of the fatigue coefficient within one group of plastics indicates the

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decisive role of static strength for fatigue. The knowledge of this fact permits an approximate prediction of the fatigue strength on the basis of the static strength. The change in the fatigue coefficient differs considerably in the two groups of plastics mentioned: The relative decrease of strength is much more rapid in the case of unfilled plastics than in glass-reinforced plastics. Considering the permanent downward tendency of the fatigue curve, and thus also the relativity of the index (σ or K), it is more suitable to take 10^6 stress cycles as a basis than 10^7 cycles. This enables testing periods to be shortened greatly without impairing the results. In order to estimate the rate of decrease of the index, an additional basis of 10^4 - 10^5 stress cycles may be used. The index of fatigue strength is strongly influenced by the cross-section of the sample. This complicates the evaluation of fatigue properties and comparison of test results for products of different cross-sections. The composition of the material has a much slighter influence on the destruction energy in the case of repeated impact stresses than in the case of usual impact-strength tests (single impact). Basing on the relative energy of a severally repeated impact (with reference to impact

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strength) it is possible to select those molded materials for which this energy is substantially higher than for most other plastics, including glass-reinforced plastics. The materials are selected on the basis of a criterion different from the one used in harmonic stresses, in which the durability and not the work into destruction is compared. S. N. Zhurkov is mentioned. There are 6 figures, 2 tables, and 22 references: 12 Soviet, 9 US, and 1 German.

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AUTHORS: Ratner, S. B., Farberova, I. I.

TITLE: Mechanical Testing of Plastics. 4. Abrasion of Plastics

PERIODICAL: Plasticheskiye massy, 1960, No. 9, pp. 61 - 69

TEXT: The present publication deals with questions on the abrasion of plastics. The resistance to wear of plastics is being investigated at many places in the USSR. Table 1 lists machines which are in use for testing plastics or would be suitable for this purpose. In general, the following conditions were applied for investigating the resistance to wear of various types of plastics: 1) Friction without lubrication, 2) four types of friction surfaces, corresponding to practical working conditions: a) rough, sharp-edged surfaces (emery paper), b) rough, blunt surfaces (wire gauze), c) smooth, hard surfaces (metal, wood, ebonite, and hard plastics, etc.), d) smooth soft surfaces (rubber and soft plastics, etc.), 3) low velocities and small loads in order to avoid heating of the material. It was found that the machines by Grasseli and by Shopper, which are generally used for testing rubber, are suitable for testing plastics.

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Both machines employ velocities of 0.3 m/sec. The load can be varied from 0.3 to 5 - 10 kg. These machines were used for preliminary studies on the abrasion of smooth surfaces and for detailed studies on the abrasion of plastics by emery paper and wire gauze (Table 2). The following results were found: Abrasion of polymer materials occurs in two ways: by cuts produced by sharp-edged surfaces (abrasive abrasion) and by elastic deformation and subsequent tearing by frictional force (frictional abrasion). The first process is accompanied by lengthwise striation of the test surface, and the second by transverse striation. Both these processes are involved in the abrasion of polymer materials. Their ratio depends on the elasticity of the material and the resistance of the surface to abrasion. The share of the frictional component is all the higher (Table 3), the more elastic the material and the blunter the edges of the abrasive grain are. In contrast to rubber, the abrasion of plastics by emery paper in the machine by Grasseli does not involve stabilization of the emery paper. Tests using emery paper should be performed in the machine by Shopper, since here sliding is always over the unused emery paper surface. The Grasseli machine is suitable for testing with the wire gauze. In abrasion of plastics (and wood) by emery

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paper the effect of load on the abrasion is described by $v = K_1 \cdot P = K_2 P/H$, where P = load and H = hardness of the material. A similar expression was previously derived for the abrasion of metals and rubber. In the abrasion of plastics (and metals or wood) by wire gauze the load exerts a stronger influence: $v = K_3 P^{\alpha} = K_4 (P/H)^{\alpha}$, where $\alpha > 1$. A similar formula was found for rubber. A comparative estimation of the resistance to wear of plastics can be based on equal load, but also on equal compression (which is determined by the ratio P/H). The ratio of the abrasion values in these cases varies for different materials. The results obtained in laboratory tests may be applied in practice, provided the ratio of the abrasive and frictional components during abrasion is equal. The share of the frictional component ($1 \geqslant f \geqslant 0$) can be determined from the test, e.g. from $f = \alpha/3\beta$. The mechanism of abrasion of any chosen sample or product is determined by external conditions (roughness, lubrication, velocity, load, temperature) and by the elasticity of the material, owing to its effect on f. This can be applied for the simulation of practical use and for laboratory tests. These experiments were carried out in collaboration with the TsNII MPS (Head of the Laboratory: Jh.M.Bilik).

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Some of the data are based on experiments performed by G. S. Klitenik by request of the authors. There are 7 figures, 3 tables, and 19 references: 16 Soviet, 3 US, and 1 British.

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B013/B055

15.8500

AUTHORS: Ratner, S. B., Frenkel', M. D., Novozhilov, A. V.

TITLE: Mechanical Testing of Plastics. 5. Testing of Heat Resistance

PERIODICAL: Plasticheskiye massy, 1960, No. 9, pp. 69 - 76

TEXT: This publication deals with heat resistance tests of plastics based on the widespread thermomechanical testing methods, i.e., the examination of changes in mechanical properties produced by temperature changes (Figs. 1 - 7, Tables 1 - 4). The upper limit of heat resistance of vitrified plastics is the temperature range at which rapid softening occurs. For these plastics the softening point corresponds to the vitrification point $T_{vitr.}$. With crystalline polymers, the limit of heat resistance is not the $T_{vitr.}$ but practically coincides with the melting point (Ref. 1). It is generally known (Ref. 2) that the $T_{vitr.}$ is no matter constant since it varies with test conditions. The softening process is strongly affected by the load (Refs. 15-17). In the case of some thermo-

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plasts, softening was observed to be a linear function of the load (Refs.15,17). Various thermosetting materials exhibited the same dependence (Figs.2 and 3). It was shown that the softening point drops with increasing load according to $T = T_o - bP$, where T_o = softening point without load, and b = change in heat resistance per unit load. Since T_o is a characteristic load-independent vitrification point of the material, it must correspond to the vitrification point determined by any method unaffected by other factors, e.g., dilatometrically. This is the case both with thermosetting plastics (Fig.4) and thermoplasts. These data show that the dilatometric method may be recommended for testing heat resistance. It must, however, be noted that its lower sensitivity renders it less effective than the method of thermomechanical curves. The most complete characterization of the heat resistance requires determination of T_o and b. For this, tests at 2 - 3 different loads, at the minimum, are necessary. Industrial methods generally apply only one and the same load (P = const) for testing different types of materials. This results in more or less fortuitous test results which are high for hard materials and low for soft materials. In rapid quality control it is advisable to test heat resistance

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at a load proportional to the initial hardness of the material, i.e., at equal initial deformation (ε_0 = const) (Fig.5, Table 2). Widely differing indices are obtained by heat resistance tests under different preset conditions (P = const or ε_0 = const) (Figs.6 and 7, Tables 3 and 4). Apart from regulations concerning the general characteristic, the temperature of heat resistance, specifications should also include regulations concerning the heat resistance coefficients of durability and other indices, in accordance with the application of the material or the working conditions the product is to be subjected to. A. P. Aleksandrov is mentioned. There are 7 figures, 4 tables, and 29 references: 23 Soviet, 3 German, 2 US, and 1 Czechoslovakian.

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S/020/60/135/002/012/036
B019/B077

15.9300

AUTHOR: Ratner, S. B.

TITLE: The Grinding Mechanism of Polymerization and the Similarity Criteria

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 2, pp. 294 - 297

TEXT: The author starts out with a definition of abrasive and friction grinding. These types of grinding depend very much on the elastic and plastic properties of the material. Resin is mentioned as a typical grinding agent when cutting is done mainly through friction. The cutting action of the grain is partly responsible for abrasive grinding. The results of tests are compiled in Table 1 from which it may be seen that the effect of friction grinding decreases with decreasing elasticity of the material, and as the roughness of the material increases, the effect of abrasive grinding increases too. A similarity criterion is developed to estimate the cutting characteristics of the material. If v is the volume of the cut and r the distance of the stripes found by B.V.Grozin,

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The Grinding Mechanism of Polymerization and the Similarity Criteria

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then $v \simeq const\ r^{3f}$, where $f = \alpha/3\beta$ is between the limits $1 \geq f \geq 0$. α and β are determined empirically. v and r for resin are given as $v = const \cdot p^{\alpha}$ and $r = const \cdot p^{\beta}$, where p denotes the load, and f is the similarity criterion for grinding materials. The author thanks I. Farberov, O. Radyukevich, T. Tikhomirov, and A. Byalynitskiy for their help. There are 2 figures, 1 table, and 4 references: 2 Soviet and 2 US.

ASSOCIATION: Gosudarstvennyy nauchno-issledovatel'skiy institut plasticheskikh mass (State Scientific Research Institute of Plastics)

PRESENTED: December 25, 1959, by V. N. Kondrat'yev, Academician

SUBMITTED: December 24, 1959

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24751
S/191/61/000/007/009/010
B101/B215

15 8510

AUTHORS: Ratner, S. B., Stinskas, A. V., Shpakovskaya, Ye. I.

TITLE: Long-time strength of plastics

PERIODICAL: Plasticheskiye massy, no. 7, 1961, 59-65

TEXT: This is a review of publications on the long-time strength of plastics. The equation by S. N. Zhurkov et al. (Ref. 1: ZhTF, 23, no. 10 (1953). Ref. 2: ibid., 25, no. 1 (1955)) is given:

$$\tau = \tau_0 \exp\left[(U_0 - \gamma\sigma)/RT\right] \quad (1),$$

where τ is the long-time strength; τ_0 a constant almost independent of the material and approximately equal to the vibration period of the atoms in the molecule ($\tau_0 \approx 10^{-12}$ sec); U_0 a constant almost equal to the activation energy of thermochemical destruction; and γ a constant depending on the structure of material, which becomes smaller as the orientation increases, and larger on plasticizing. Results of other scientists are presented,

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Long-time strength of plastics

especially data on glass-reinforced plastics. The difference between short-time and long-time tests is mentioned. In glass-reinforced plastics, the long-time strength after 1000 hr averages 2/3 of the short-time strength, and 1/2 in non-reinforced plastics. Papers by A. W. Thompson (see below), B. Pusey (see below), and R. C. Hooper (see below) on glass-reinforced epoxy resins are mentioned. Simplification of the complicated long-time test by extrapolation or, according to S. Goldfein (see below), by temperature increase according to the equation $T \cdot (20 + \log \tau) = \text{const}$ (5) is discussed. Comparison of long-time strength and fatigue strength (by cyclic loading) shows that in the latter case, the strength is considerably reduced probably due to local heating. Under all test conditions, reinforced plastics generally show higher values than non-reinforced plastics. A. P. Aleksandrov, Tomashevskiy, and a report made by Yu. S. Lazurkin at the Conference on the Strength of Polymers and Polymer Materials, Moscow, May 16-18, 1960, are mentioned. The authors thank T. N. Kryuchenko and D. I. Verizhnikova for compiling publications on glass-reinforced plastics. There are 5 figures, 3 tables, and 24 references: 11 Soviet-bloc and 13 non-Soviet-bloc. The most important references to English-language publications read as follows: A. W. Thompson,

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Reinforced Plastics, no. 11 (1957); B. B. Pusey, R. H. Carey, Modern Plastics, 32, no. 7, (1955); R. C. Hooper, Plastics Technology, 3, no. 8 (1957); S. Goldfein, A. S. T. M. Bulletin, no. 224 (1957).

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S/883/62/000/000/011/020
E194/E155

AUTHOR: Ratner, S.B.

TITLE: Methods of assessing wear of polymeric materials

SOURCE: Metody ispytaniya na iznashivaniye; trudy soveshchaniya, sostoyavshegosya 7-10 dek. 1960. Ed. by M.M. Khrushchov. Moscow, Izd-vo AN SSSR, 1962. 106-113

TEXT: Wear testing of rubber and plastics is reviewed. Wear may be abrasive, frictional or mixed. In general, rubbing against an abrasive need not rate materials in the same order as rubbing against a metal mesh, and both kinds of surface should be used in testing and both need standardising. No lubricants should be used, because they blur the differences between materials. Tests with free abrasive, as in sand blasting, may also be useful. The stability of the wear process is discussed with particular reference to conditioning of the wear surfaces. In tests with an abrasive, the wear rate is directly proportional to the load; in tests with a metal mesh the wear rate is usually proportional to some higher power of the load, and so several different test loads should be used. In the case of rubber the wear rate against an

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abrasive is readily predicted from the mechanical properties, mainly because wear is frictional. With plastics, wear is mainly abrasive and the same relationships do not hold. Laboratory wear tests alone, even of the two kinds together, can only serve as screening tests. Final judgment of materials must be based on tests which most nearly simulate service conditions. Further analysis of the wear mechanism is required to assess the wear of polymers. The influence of composition and structure of rubbers and polymers on wear resistance needs study to establish the relationships with simpler mechanical properties of the material. There are 4 figures.

S/191/62/000/001/006/006
B139/B110

AUTHORS: Dvuglova, L. Ya., Lur'ye, E. G., Radyukevich, O. V., Ratner, S. B., Farberova, I. I.

TITLE: Wear (abrasion) of plastics and methods for its evaluation

PERIODICAL: Plasticheskiye massy, no. 1, 1962, 60-66

TEXT: Specimens of plastics were tested without lubrication at low speeds and loads, either with monocorundum abrasive paper M150 (M 150), ГОСТ344-57 (GOST 344-57) on Schopper machines (produced by the Metallist Plant, Leningrad), or with steel-wire cloth ГОСТ 3826-47 (GOST 3826-47) on Grasseli machines. The nondimensional wear coefficient v for plastics does not depend on the cross section of the specimens. The exchange of abrasive paper and wire cloth affects neither wear nor the spread of test results, which was estimated from the mean square deviation σ and from the variation coefficient $\delta = \frac{\sigma}{v} \cdot 100\%$. Since the spread increases during the abrasion of small masses, $\delta \leq 5\%$ was strived for. This was achieved by abrading 20-30 mg of mass in the test with abrasive paper, and 10-20 mg

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Wear (abrasion) of plastics ...

in the test with wire cloth. Values obtained for the wear of various plastics, rubbers, and wood in reference to the wear of organic glass are presented. In the abrasive paper test with a load of 1 kg/cm^2, v is $3.7\ mm^3/m\cdot cm = 3.7\cdot 10^{-5}$ for organic glass. This value was assumed to be 100. In the wire cloth test, v is $1.3\cdot 10^{-7}$; this value was assumed to be 1. The abrasion coefficient α shows the extent of increase of the wear coefficient v with an increase of the standard pressure P according to the equation $v = K\cdot P^{\alpha}$ (2). For plastics, α was in most cases 1-2, since the wear on the wire cloth is caused not only by friction but also by the cutting effect. The nature of abrasion on the wire cloth is similar to that on a smooth metal surface. The wear resistance of plastics during abrasion on surfaces of varying roughness may thus be compared. Wear may be considered a fatigue process of the upper material layers owing to repeated deformation caused by the elevations of the grinding body, and can be determined from the number n of fatigue cycles. In the equation $v = i\frac{P}{H}$ (3) (H = hardness), according to I. V. Kragel'skiy, the wear i is inversely proportional to n. For determining the wear, M. M. Reznikovskiy derived the expression

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Wear (abrasion) of plastics ...

v = const $P^{(b+2)/3}$, where b expresses the slope of the fatigue curve by Wehler according to the relation $(\sigma_0/\sigma)^b = n$. σ_0 = strength under single loading, σ = amplitude value of repeated dynamic stresses. b can thus be determined as the tangent of the slope of the curves log n = f[log(σ_0/σ)]. Owing to the destruction of molecules, the molecular weight of the wear product is lower than that of the initial material. The results were well reproducible. While for abrasion with metal screen a qualitative correlation with the fatigue strength was found, a correlation with the impact strength exists for abrasion with sandpaper. There are 4 figures, 2 tables, and 31 references: 24 Soviet and 7 non-Soviet. The four most recent references to English-language publications read as follows: S. V. Ratner, V. E. Gool, G. S. Klitenik, Wear, 2, No. 2, 127 (1958); ASTM Spec D 1044-56; ASTM Standards on Plastics, ASTM D 1242, 56 (1957); J. Burns, E. Story, Ind. Eng. Chem. 20, No. 9, 895, (1952).

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RATNER, S.B.

Mechanical and engineering characteristics of plastics. Plast.-massy no.3:77 '62. (MIRA 15:4)
(Plastics--Standards)

S/191/62/000/004/001/017
B110/B138

AUTHORS: Igonin, L. A., Ratner, S. B., Tatevos'yan, G. O.

TITLE: Improved methods of testing plastics

PERIODICAL: Plasticheskiye massy, no. 4, 1962, 1-2

TEXT: With the aim of standardizing methods of testing plastics, the pervoye mezhvedomstvennoye rabocheye soveshchaniye po metodam ispytaniy plastmass (First Interdepartmental Working Conference on Methods of Testing Plastics) was held in Moscow in 1961 with 480 representatives from 179 organizations. V. A. Kargin, G. M. Bartenev, L. A. Igonin, Yu. M. Malinskiy, D. F. Kagan, S. A. Reytlinger, and A. D. Sokolov reported on the current situation. Then the following were discussed: (a) mechanical properties, (b) technological properties, (c) aging and chemical stability, (d) physical and chemical properties, (e) dielectric properties, (f) chemical and analytical methods, (g) technical requirements. Seven permanent working groups have been formed to study (a); four of them are on the standardization of mechanical tests (static, dynamic properties, friction and wear, heat and frost resistance), and

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three of them on the mechanical properties of foam and porous plastics, glued joints and microspecimens. Three permanent groups are studying (b); methods of testing thermoreactive materials, rheological characteristics of thermoplastics, and thermophysical properties. Three temporary groups are studying (c); chemical, thermal, optical, atmospheric, and biological stability, and migration of plasticizers. Temporary groups are studying (d); molecular weight determination, viscosity of solutions, gas and moisture permeability of films, etc. Permanent groups are studying (e). Temporary groups are studying (f); spectral analysis, analysis of aldehydes in mixed polyvinyl acetals, electrometric determination of monomers in polymers and copolymers, determination of Cl in organo-siloxanes, etc. One group is studying (g); technical requirements for resol and novolak resins, powder bakelite, phenol formaldehyde plastics, laminated plastics, aminoplasts, PVC, polystyrene and its copolymers, polyethylene, production and conditioning of samples. A permanent working commission for methods of testing plastics which is to be established within the Sovet po sinteticheskim materialam na osnove vysokomolekulyarnykh soyedineniy pri Goskomitete Soveta Ministrov SSSR po koordinatsii nauchno-issledovatel'skikh rabot (Council for Synthetic Materials Based on

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High-molecular Compounds at the Goskomitet of the Council of Ministers USSR for the Coordination of Scientific Research) will: (1) exchange experience on test methods, (2) coordinate scientific work, (3) standardize tests, (4) recommend testing apparatus for series production, (5) check proposals made by the ИСО(ТК-61) (ISO(TK-61)). It will consist of the following working groups: RG-1 - terminology and definitions, RG-2 - mechanical properties, RG-3/7 production and standardization of specimens, RG-4 for technological and thermal properties, RG-5a for physical and chemical properties, RG-5b for analytical methods, RG-6 for aging and chemical stability, RG-8 for dielectric properties, RG-9 for technical requirements, RG-10 for cellular materials. Standardization will provide for: (1) production processes, (2) good design of plants for processing, (3) reliable quality guides for industrial production, (4) engineering characteristics, (5) appropriate research for developing new materials. The Komissiya po mekhanike polimerov Goskhimkomiteta (the Goskhimkomitet Commission for Polymer Mechanics) has worked out five complex mechanical and technological characteristics for some polymers. State standards are to be published in the near future. Two interdepartmental commissions will be established for testing plastic

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B110/B138

tubes and polymer films. The production of apparatus and the training of laboratory staff will be intensified.

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S/191/62/000/005/001/012
B110/B101

AUTHORS: Kargin, V. A., Malinskiy, Yu. M., Ratner, S. B.

TITLE: Development of the mechanics of plastics

PERIODICAL: Plasticheskiye massy, no. 5, 1962, 1-2

TEXT: An understanding of the behavior and service life of plastic products involves studying not only the purely mechanical relaxation processes but also the mechanical-chemical process of destruction, especially through repeated bulk fatigue failure or abrasion. Good mechanical properties are required for (1) use in supporting, shock absorbing, packing, etc., (2) dielectrics, (3) heat insulators, and (4) water- and gas-tight shells. In these respects, the fundamental mechanical indices must be known, such as (1) strength, (2) maximum elongation, (3) elasticity, (4) resilience, and (5) heat resistance. The mechanics of plastics must therefore be developed as an applied science able to evaluate the properties of plastics characterized as: (1) thermoreactive and thermoplastic, (2) brittle and soft, (3) monolithic and porous, (4) filled and unfilled, (5) isotropic and anisotropic. For this

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purpose, general mathematical theories need to be elaborated for: (1) strength, (2) elasticity, (3) plasticity, and (4) relaxation, considering the molecular, supermolecular, and macroscopic structure of different plastics. The Komissiya po mekhanike polimerov Goskhimkomiteta (Commission for Polymer Mechanics of the Goskhimkomitet) is compiling records of experimental results regarding: (1) effect of temperature and pressure on viscosity, (2) density, (3) elastic relaxation, (4) coefficient of external friction, (5) thermophysical data, and (6) effect of temperature on the yield curves. By 1963 it is hoped to have so compile the (a) elastic, (b) relaxation and (c) strength properties of all rigid plastics, for various temperatures and static and dynamic loads. Similar records are needed for the behavior of thermoreactive plastics during processing as well as for technical evaluation of foam plastics, films, soft and semirigid plastics. It is also necessary to work out uniform methods for evaluating the properties of plastics as regards workability, and to design suitable experimental apparatus. To afford reliable basis for calculating the strength and hardness of many plastic constructions, a theory of the mechanical behavior of plastics under complicated stresses should be elaborated by the Institutes of the Akademiya nauk (Academy of

Sciences) in collaboration with universities and leading scientists. The planned Nauchno-issledovatel'skiy institut po primeneniyu plastmass v mashinostroyenii (Scientific Research Institute for the Application of Plastics in Machine Building) is to supply designers with methods of calculation for complicated machine parts and constructions, and to pursue the development of research methods for plastic products. The Institutes of the AN SSSR (AS USSR), the related industry and advanced schools are to train students conversant with physico-mechanical investigation methods for polymers, in the field of the mechanics of plastics and polymers. Comprehensive studies in all fields appertaining to the mechanics of plastics are to be undertaken in the institutes of the Goskhimkomitet jointly with scientific, technical and other organizations, aiming to achieve highly effective methods of processing, rational application and extensive replacement of expensive materials.

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S/191/62/000/009/006/012
B101/B144

AUTHORS: Farberova, I. I., Ratner, S. B., Lur'ye, Ye. G., Gurman, I. M., Ignatova, T. A., Nosova, L. A.

TITLE: Effect of some factors of composition and manufacture on the wear of plastics

PERIODICAL: Plasticheskiye massy, no. 9, 1962, 35 - 38

TEXT: The results of wear tests on plastics using emery cloth (EC) and metal gauze (MG) are given. For MG wear tests and tests with smooth steel the equation $v = v_1 P^{\alpha}$ holds mainly for the frictional wear while the EC test characterizes the purely abrasive wear. Data of wear ($mm^3/m \cdot cm^2$ at 5 kg/cm^2) at 60°C (first figure EC test, second figure MG test, third figure -) for epoxy compounds with various fillers: ЭД-5 (ED-5) resin with dibutyl phthalate without filler: 48, 1.8, 3.5; with graphite: 70, 0.05, 1.8; with iron powder: 25, 0.05, 1.6. For polyvinylchloride plastics filled with asbestos, talcum or quartz an initial decrease of wear with increasing filler content is followed by an increase. The minimum of
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Effect of some factors of composition... B101/B144

wear is explained by the limit of compatibility between filler and polymer. For polyamides, a strong reduction of wear is already achieved with low filler addition. Data for polyamide 68 (first figure EC test, second figure MG test, $mm^3/m \cdot cm^2$): without filler 0.61, 0.0025; with 5% talcum 0.64, 0.0006; with 20% talcum 0.73, 0.0014; with 40% talcum 1.10, 0.010; with 0.5% MoS_2 0.91, 0.0003; with 5% MoS_2 1.01, 0.0006. The MG test is much more sensitive than the EC test. The EC test shows the wear in polymers to be a linear function of the product of impact strength and hardness, whereas according to the MG test the wear is a linear function of the product of tensile strength and breaking elongation. There are 3 figures and 3 tables. The English-language reference is: ASTM Standards on Plastics, ASTM D1242, 56 (1957).

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41916

S/191/62/000/011/011/019
B101/B186

AUTHORS: Lur'ye, Ye. G., Ratner, S. B.

TITLE: The role of fatigue and destruction in abrasion of polymers

PERIODICAL: Plasticheskiye massy, no. 11, 1962, 47-48

TEXT: The lower resistance to wear occasioned by fatigue of the upper polymer layer was studied. Unfilled rubber was first rubbed with a metal net, then covered with 10 μ thick terylene film and again rubbed for 20-30 hrs. The kinetics of abrasion was determined after removal of the protective film. Polymethyl methacrylate (PMMA) was fatigued by rubbing against a smooth steel surface, after which the abrasion was determined again. The results (Fig. 1) show that the upper layer of rubber fatigues to a depth of 0.1 mm that of PMMA down to about 0.01 mm. Similar results were obtained for rubber filled with carbon black. Multiple compression was much less effective, fatigue not occurring before 2 hrs. The mechano-chemical destruction of polymers is confirmed by the fact that the abraded crumbs had a lower intrinsic viscosity than the initial materials. For

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PMMA and vinyl plastic, the decrease in intrinsic viscosity was greater in abrasion with metal net than with emery cloth. For polystyrene and polycarbonate, however, the decrease in intrinsic viscosity depended on the size of crumbs, and the intrinsic viscosity of crumbs abraded with fine emery cloth was lower than that of crumbs obtained with coarse emery cloth. Thus the degree of destruction depends not only on the fatigue but also on the degree of crushing. There are 2 figures and 1 table.

Fig. 1. Dependence of the rate of wear on the fatigue. (1) PMMA fatigued by sliding over smooth steel; (2) non-fatigued PMAA; (3) unfilled rubber fatigued by rubbing with metal net (with protective film); (4) unfilled rubber not fatigued. Ordinate: wear rate$\cdot 10^{-6}$ min^{-1}, left-hand scale for curves 1 and 2, right-hand scale for curves 3 and 4; abscissa: τ, min, upper scale for curves 1 and 2, lower scale for curves 3 and 4.

S/191/62/000/012/012/015
B101/B186

AUTHORS: Stinskas, A. V., Ratner, S. B.

TITLE: The hardening effect in plastics at the rest period during fatigue failure testing

PERIODICAL: Plasticheskiye massy, no. 12, 1962, 56-57

TEXT: It was found that interrupting the fatigue test gave the plastics a higher endurance after the tests were resumed. The following data are given:

I	II	III	a IV	b	V	VI
caprone	270	1000	46	65	23	150%
viniplast	120	3800	140	1050	250	700%
ditto (1)	170	3800	250	355	100	150%
polyester resin ПН-1 (PN-1)	200	1000	95	190	50	200%
ditto (2)	200	1000	95	600	50x10	>600%

Card 1/2

The hardening effect in plastics ... S/191/62/000/012/012/015
B101/B186

(I) substance; (II) stress, kg/cm^2; (III) frequency, cycles/min; (IV) endurance, (a) continuous test, (b) test with a 15-20 hrs period of rest; (V) fatigue before the period of rest, cycles·10^3; (VI) increase of endurance to (%); (1) after 1 year of natural aging; (2) 10 intervals of rest after 50,000 cycles each. Similar results were obtained with cyclic stretching where no loads occurred with alternating sign. The recovery effect reached a maximum with a certain degree of pre-stretching (~ 25%) and set in only after a certain period of rest (15-20 hr). Shorter intervals of rest (0.5 hr) showed no recovery effect. During the test, the temperature increase in the samples was small (2-10°C) and could not be the reason for the recovery effect. The restoration effect is assumed to be due to physio-chemical processes and perhaps also cross-linking. In practice, this effect must be taken into account when plastics are processed. There are 2 figures and 2 tables.

Card 2/2

S/032/62/028/004/026/026
B116/B104

AUTHOR: Ratner, S. B.

TITLE: Comprehensive record of mechanical characteristics of plastics

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 4, 1962, 514-516

TEXT: A record worked out by the Komissiya po mekhanike polimerov Gosudarstvennogo Komiteta po khimii Soveta Ministrov SSSR (Commission of Mechanics of Polymers of the State Committee on Chemistry of the Council of Ministers USSR) (Yu. M. Malinskiy, chairman of the Commission) is presented. The data were prepared by the working group of the Commission including: S. B. Ratner, Head (NIIPlastmass), A. M. Zhukov (Institut mekhaniki AN SSSR (Institute of Mechanics AS USSR)), B. I. Panshin, A. L. Rabinovich (Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics AS USSR)), and A. V. Stinskas (NIIPlastmass). The characteristics were determined for simple states of stress (pressure, tension, shear, bending). (A) Characteristics required for a general technological rating of plastics: (1) Specific gravity. (2) Hardness

(Brinell). (3) Modulus of elasticity. (4) Long-time tensile strength. Deformation curve for stress up to 100 hr, the stress amounting to 80 % of the strength at short-time tensile test. (5) Maximum and relative elongation. (6) Strength. (7) Durability. (8) Fatigue strength. (9) Impact strength. (10) Friction coefficient. (11) Resistance to wear. (12) Heat resistance. Softening point. (13) Frost resistance. Brittle point for low-temperature plastics. (14) Effect of temperature on strength. Tensile strength at -30 and +60°C. (15) Other characteristics: stability under the action of specific external factors such as liquid or gaseous media, radiation, heat. (B) Characteristics required for calculating power constructions: (1) Characteristics to be determined by short-time "static" tests. (2) Characteristics to be determined under long-time static loads: (a) Curves for the dependence of the tensile (compressive) strength on the effective time of constant load; or the constants $\frac{u_o - \gamma\sigma}{RT}$, where u_o, τ_o, γ are taken from Zhurkov's formula $\tau = \tau_o e$ (if applicable to the respective material). (b) Deformation-time curves (creeping) under tension and pressure (or bending) under constant loads equal to 50, 70, 80, 90 % of the breaking point; or the quantities $\Delta\varepsilon/\Delta \log t$ and ε_1 (ε_1 = deformation per unit time if $\varepsilon = f(\log t)$ is nearly linear). (3) Characteristics to be determined under short-time dynamic loads: (a) breaking point - deformation rate curves in semilogarithmic coordinates $\sigma = f(\log v)$ or the quantities $\Delta\sigma/\Delta \log v$ and σ_1 (σ_1 = stress at an assumed unit velocity); (b) dynamic modulus of elasticity. (4) Characteristics to be determined under dynamic loads: (a) fatigue strength with 10^5, 10^6, 10^7 cycle loads; (b) logarithmic oscillation decrement during bending. (5) For materials subjected to friction: sliding friction coefficient for different pairs with and without lubrication at different velocities and loads. (6) Estimation of the effect of temperature on mechanical properties. This effect is characterized by the modulus of elasticity and the breaking point under tension at -50, +20, +100°C, and, if possible, at 200°C. (7) Estimation of the effect on the breaking point under tension by the surrounding medium most characteristic of the use of the respective material. (8) Estimation of the spread of data. A similar record is being worked

S/032/62/028/004/026/026
Comprehensive record of mechanical... B116/B104

out for soft and half-rigid plastics, porous and foam plastics, and film materials. Such a record exists already for rubber, raw rubber mixtures, and thermoplastics. There are 1 table and 1 Scviet reference.

Card 4/4

S/020/62/144/002/014/028
B104/B102

AUTHOR: Ratner, S. B.

TITLE: Analogies in abrasion

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 2, 1962, 327-329

TEXT: This review article discusses results obtained from studies on abrasion between 1952 and 1962. The relative resistance to wear even of widely differing materials is shown to be the same for various abrasives. There are 2 figures.

ASSOCIATION: Gosudarstvennyy nauchno-issledovatel'skiy institut plasticheskikh mass
(State Scientific Research Institute of Plastics)

PRESENTED: December 20, 1961, by P. A. Rebinder, Academician

SUBMITTED: December 8, 1961

Card 1/1

L 13367-63 EPF(c)/EPR/EWP(j)/EDS/EWT(m) AFFTC/ASD Pr-4/Ps-4/
Pc-4 RM/WW

ACCESSION NR: AP3003308 S/0191/63/000/007/0038/0042

AUTHORS: Ratner, S. B.; Farberova, I. I.; Radyukevich, O. V.; Lur'ye, Ye. G.

TITLE: Interrelation of durability of plastics with other mechanical properties

SOURCE: Plasticheskiye massy, no. 7, 1963, 38-42

TOPIC TAGS: durability of plastic, mechanical properties of plastic, plastics, elasticity, softening point

ABSTRACT: Analysis shows that the wear V is related to the mechanical properties of the plastics by the following qualitative relationship:

$$V \sim \frac{\mu}{H\sigma\varepsilon}$$

where V is the reduction of volume or size per unit of friction travel. One of the important factors in this formula which characterizes the elasticity of the material during destruction is ε which is the factor of rupturing elongation. The experiments show that an increase of ε has a fundamental role in the increase of durability. In the examination of a large number of plastics the correlation between the expression $H\sigma\varepsilon/\mu$ and durability was noticed indeed. The main

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L 13367-63

ACCESSION NR: AP3003308

formula shows that the increase of temperature may result not only in the decrease of durability, but also in the increase of durability as a result of a sharp increase of ε with an excessive compensating decrease of σ. The experiments in wear with plastic to metal samples at various temperatures showed the justification of the theoretical analysis. The temperature curve of the wear has 2 extremes which form a decreasing curve up to the softening point temperature. The increase of temperature in this region results in a sharp increase of durability. The increase of temperature practically does not affect the wear of the crystalline materials up to the polymer melting point and then shows a sharp decrease in durability. The sharp increase in wear during the softening of plastics is followed by a sharp change in friction. This friction increases for the amorphous materials as a result of their transformation into a highly elastic state and decreases for crystalline materials as a result of their melting In both cases these sharp changes in the coefficient of friction can be used as a method of determination of the thermostability of materials under the conditions of wear. Orig. art. has: 1 table and 8 figures.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 30Jul63 ENCL: 00

SUB CODE: MA NO REF SOV: 015 OTHER: 001

Card 2/2

DARKOV, Ye.A.; RATNER, S.B.; ZUYEV, A.P.; GURARIY, M.G.

Methods for impact bending tests of plastics. Standartizatsiia 27 no.5:41-44 My '63. (MIRA 16:6)

(Plastics—Testing)

L 12417-63 EPR/EWP(j)/EPF(c)/EWT(m)/BDS AFFTC/ASD Ps-4/Pc-4/Pr-4 RM/WW

ACCESSION NR: AP3001411 S/0020/63/150/004/0848/0851 70

AUTHOR: Ratner, S. B.

TITLE: The role of fatigue processes in the wear of polymeric materials 15

SOURCE: AN SSSR. Doklady, v. 150, no. 4, 1963, 848-851

TOPIC TAGS: wear of plastic materials

ABSTRACT: Author states that wear is a process of surface fatigue and destruction or that the separation of surface particles from the friction layer is not a single act but is the result of weakening of the surface layers which are subjected to a multi-deformation during sliding process. The examination of the above supposition proved to be unrealistic since the properties of materials are very much dependent on the conditions of experiment. The final results show that the wear of polymeric materials may be as result of a fatigue process. "The author expresses his thanks to G. S. Klitenika for great help in this work and to P. A. Rebinder for the discussion of results." Orig. art. has: 2 tables and 2 graphs.

ASSOCIATION: Gosudarstvenny*y nauchno-issledovatel*skiy institut plasticheskikh mass (State Scientific Research Institute for Plastics)

Card 1/2

ACCESSION NR: AP3002880 S/0020/63/150/005/1084/1086

AUTHOR: Ratner, S. B.

TITLE: Effect of temperature on the wear resistance of polymeric materials. The role of forced elasticity

SOURCE: AN SSSR. Doklady, v. 150, no. 5, 1963, 1084-1086

TOPIC TAGS: wear, wear resistance, mechanical properties, strength, elongation-at-break, hardness, friction, friction coefficient, brittle state, forced-elastic state, high-elastic state, amorphous polymers, crystalline polymers, poly(methyl methacrylate), polypropylene, polycarbonate, ftoroplast-3, polychlorotetrafluoroethylene

ABSTRACT: The formula $V \sim \mu / H\sigma\varepsilon_m$, where V is wear expressed as drop in height per friction-path length; μ, friction coefficient; H, hardness; σ, strength; and ε_m, elongation-at-break, has been proposed to describe qualitatively the relationship between wear in a polymer and simple mechanical properties such as friction coefficient and elongation-at-break. The effect of

Card 1/4

ACCESSION NR: AP3002880

temperature on these properties and hence upon wear proper was analyzed theoretically for 1) amorphous and 2) crystalline polymers. The conclusions for case 1 are illustrated in Fig. 1 of the Enclosure. Since in case 2 the high-elastic state is absent and the brittle state lies far below room temperature, the crystalline polymer behaves as a forced-elastic material. Wear remains at a minimum over a wide temperature range, rising sharply only in the vicinity of the softening point. The theory was tested experimentally with a modified MAST-1 KT-type machine. Amorphous polymers were exemplified by poly(methyl methacrylate) and nonheat-treated polypropylene and polycarbonate [unspecified], and crystalline polymers, by ftoroplast-3 [polychlorotrifluoroethylene] and heat-treated polypropylene. From a comparison of the experimental data with the theoretical conclusions it was determined that since hardness, tensile strength, elongation-at-break and the brittle, glass-transition, and flow temperatures are measurable only under conditions substantially different from those in wear, only friction-temperature data correlate quantitatively with wear-temperature data. On the basis of this correlation, the validity of the formula was confirmed and it was

ACCESSION NR: AP3002880

shown that in an amorphous polymer, contrary to generally accepted ideas, a sharp increase in elongation-at-break in the forced-elasticity region may cause wear-resistance actually to increase with an increase in temperature. The paper was presented by Academician V. A. Kargin. "In conclusion the author expresses his gratitude to P. A. Rebinder and Yu. M. Malinskiy for discussing the results of the study." Orig. art. has: 1 formula, 4 figures, and 1 table.

ASSOCIATION: none

SUBMITTED: 04Feb63 DATE ACQ: 15Jul63 ENCL: 01

SUB CODE: 00 NO REF SOV: 010 OTHER: 001

ACCESSION NR: AP3002880

ENCLOSURE: 01

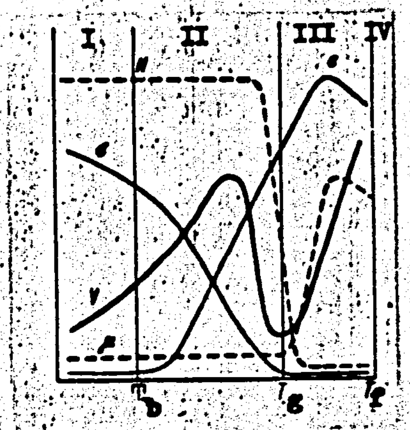

Fig. 1. Effect of temperature on the mechanical properties of amorphous polymers
σ - strength; ε - elongation-at-break; H - hardness;
μ - friction coefficient; V - wear; T_b - brittle temperature;
T_g - glass-transition temperature; T_f - flow temperature.
Region I - brittle state; II - forced-elastic state; III - high-elastic state; IV - viscoplastic state.

Card 4/4

L 35041-65 EWT(m)/EPF(c)/EWP(j)/T Pc-4/Pr-4 RM/GS

ACCESSION NR: AT5004095 S/0000/64/000/000/0031/0045

AUTHOR: Ratner, S. B.

TITLE: Comparison of wear in rubber and in plastics

SOURCE: Nauchno-tekhnicheskoye soveshchaniye po friktsionnomu iznosu rezin, Moscow, 1961. Friktsionnyy iznos rezin (Frictional wear of rubber); sbornik statey. Moscow, Izd-vo Khimiya, 1964, 31-45

TOPIC TAGS: rubber, rubber properties, rubber research, plastic material

ABSTRACT: The wear of plastics as well as the wear of rubber is basically a mechanical process which depends to a great extent on the mechanical properties and physical state of the polymer. Plastics generally behave as glasslike, crystalline solids, while rubber is in a highly elastic state. However, since rubber and plastics are both polymers, no definite boundary may be drawn between them. Thus, hard rubbers, (highly filled or overvulcanized rubbers) resemble elastic plastics (polyolefins, fluorinated polymers, etc.). Two factors influence the wear of these intermediate substances: friction and abrasion. It was found that the index of wear of rubber V on sandpaper may be correlated with strength σ and elasticity D through the following simple formula:

L 35041-65

ACCESSION NR: AT5004095

$$V = \text{const}\ \frac{\mu\ (1 - D)}{\sigma}$$

This formula was verified for over 100 different types of rubber. Wear is related to load during testing through the formula $v = kp^{\alpha}$ where k is wear when the pressure is 1 kg/cm^2 and p is pressure on the specimen in kg/cm^2. In testing materials on sandpaper this formula is simplified since $\alpha = 1$. The article discusses the mechanism of the wear of polymers which includes the summation of factors which are responsible for removal of the surface layer during friction wear and abrasive wear. Orig. art. has: 4 figures and 5 formulas.

ASSOCIATION: none

SUBMITTED: 05Aug64 ENCL: 00 SUB CODE: MT

NO REF SOV: 035 OTHER: 001

Card 2/2

L 35042-65 EWT(m)/EPF(c)/EWP(j)/T Pc-4/Pr-4 RM/GS

ACCESSION NR: AT5004097 S/0000/64/000/000/0077/0087

28
B+1

AUTHOR: Klitenik, G. S.; Ratner, S. B.

TITLE: Characteristic wear of rubber against metal gauze

SOURCE: Nauchno-tekhnicheskoye soveshchaniye po friktsionnomu iznosu rezin. Moscow, 1961. Friktsionnyy iznos rezin (Frictional wear of rubber); sbornik statey. Moscow, Izd-vo Khimiya, 1964, 77-87

TOPIC TAGS: rubber, rubber research, rubber properties, mechanical working, metal gauze, wear resistance, friction

ABSTRACT: The purpose of this work was to develop better methods for testing rubber. In the use of rubber, two basic types of interactions are observed: cutting and slippage. The former takes place during the running of tires and rubber soles on a gravel road, while the second interaction occurs when belts are run on pulleys. Metal gauze is a material which subjects rubber to both types of wear. Gauze is durable over long periods of time and in addition it permits testing of swollen and lubricated rubber samples. The results of tests for wear against metal gauze are much more dependent on the composition of the rubber and the degree of vulcanization than the results of tests on sandpaper. A correlation is

L 35042-65

ACCESSION NR: AT5004097

made between wear against metal gauze and wear against a solid metal surface. An investigation was made of the effect of loading on the wear of rubber against metal gauze, where the specific wear in $mm^3/cm^2 \cdot m$ is $v = v_1 p^\alpha$, where v_1 is a constant which is numerically equal to wear when $p = 1$ kg/cm^2. Experimental data show that in sandpaper tests α is close to 1, while for tests with metal gauze α differs from unity. The quantity α is a function of the intensity of intermolecular forces. The higher polarity of polymers and the introduction of active fillers increase the value of α while an increase in the degree of swelling in rubber generally lowers α. Rubber wear was studied in relationship to its physical and mechanical properties. The formula $(v_1)^\gamma = A \frac{\mu\eta}{\sigma_0 E^{\alpha-1} K}$ relates rubber wear to a reduction in its strength, hardness and elasticity where γ is an empirical coefficient; A is the proportionality factor; μ is the coefficient of friction; η -- (100-D) represents hysteresis losses (where D is recoil elasticity in %); σ_0 is tensile strength in kg/cm^2; E is the compression modulus of the rubber in kg/cm^2; K is the aging factor. In addition, this formula relates wear to fatigue and aging in rubber. The effects of the lattice constants for the gauze and the area of the specimen were also studied. The article concludes with an evaluation of the distribution of wear between abrasive and friction wear.

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0

L 35042-65

ACCESSION NR: AT5004097

Orig. art. has: 7 figures, 9 formulas and 4 tables.

ASSOCIATION: none

SUBMITTED: 05Aug64 ENCL: 00 SUB CODE: MT

NO REF SOV: 017 OTHER: 003

Card 3/3

L 23583-65 EWT(m)/EPF(c)/EPR/EWP(j) Po-4/Pr-4/Ps-4 WW/RM

ACCESSION NR: AP4049383 Z/0009/64/000/011/0589/0594

AUTHOR: Ratner, S. B.; Farberova, I. I.; Lurje, Je. G. (Lur'ye, Ye. G.); Stinskas, ~~A. V.~~

TITLE: Long term resistance of plastics to dynamic stress

SOURCE: Chemicky prumysl, no. 11, 1964, 589-594

TOPIC TAGS: wear resistance, fatigue strength, plastic durability, durability testing, plastic additive, abrasive strength

ABSTRACT: The authors have published several previous articles on this subject, mostly in Russian journals. The present article is therefore a general summary of their research. They point out that the resistance of plastics to mechanical wear and fatigue depends on the course of both mechanical and mechanical-chemical destructive processes. Abrasion and friction both cause wear. The tests described were carried out with abrasives and plastics in a way which was similar to wear as it occurs in practice, so that the experimental results can readily be applied to industrial conditions. The durability of plastics increases with hardness and duration of testing. Since fatigue also plays a role, additives are recommended to slow down the destructive processes, but no specific additives are discussed. Cooling during stress increases resistance to fatigue. During cyclic stress,

L 23583-65

ACCESSION NR: AP4049383

partial recovery of the resistance to fatigue is often noted. Orig. art. has: 8 figures and 3 tables.

ASSOCIATION: NIIPM, Moscow

SUBMITTED: 01Sep62 ENCL: 00 SUB CODE: MT

NO REF SOV: 016 OTHER: 001

Card 2/2

FARBEROVA, I.I.; RATNER, S.B.

Evaluating the wear resistance of plastics. Standartizatsiia 28 no.1:25-28 Ja '64. (MIRA 17:1)

MALINSKIY, Yu.M.; RATNER, S.B.; REZNIKOVSKIY, M.M.; POLYAKOV, Yu.M.

Characteristics of polymer materials. Standartizatsiia 28 no.8: 23-28 Ag '64. (MIRA 17:11)

L 47337-65 EPF(c)/EWP(j)/EWT(m) Pc-4/Pr-4 RM

ACCESSION NR: AP5009319 S/0191/65/000/004/0039/0044

AUTHORS: Frenkel', M. D.; Ratner, S. B.

TITLE: Properties and use of plastics. 2. A study of the temperature of brittleness of plastics

SOURCE: Plasticheskiye massy, no. 4, 1965, 39-44

TOPIC TAGS: brittleness, brittle point, brittle state, elasticity, material strength/ M 71 resin, PE 150 polyethylene, PVKh plasticate

ABSTRACT: Experiments to determine the effects of temperature upon the brittleness of certain plastics were performed. Particular emphasis was given to the temperature range in which the plastics undergo transition from an elastic to a brittle condition. The stress and strain characteristics of five plastics were measured against varying temperatures. Figure 1 on the Enclosure shows the nature of the experimental data. Three temperatures sought were: T_c - the vitrification temperature, T_ε - the temperature of transition from large destructive elongation to small elongation, T_σ - the temperature at which the strength limit corresponds to the limit of forced elasticity. Testing methods followed the precepts set forth in ASTM (Standards on Plastics, D746-57T, 1958), and those prescribed by P. N. Bestelink and

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L 47337-65
ACCESSION NR: AP5009319

S. Turner (ASTM Bulletin, No. 231, 68, 1958). The transition temperature interval for the plastics tested is given in a table (see Fig. 2 on the Enclosure). Additional tests were conducted to determine the effect of specimen thickness in resisting impact deflections. The authors conclude that even below the vitrification temperature there is an intermediate brittle-elastic region. The more nonhomogeneous the material, the larger is this temperature region, and, in general, the nonhomogeneity of test materials is responsible for the diversity in the temperatures noted. The authors thank T. V. Dvorkina and L. P. Yakovleva for assisting in the work. Orig. art. has: 7 figures.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 02 SUB CODE: MT

NO REF SOV: 010 OTHER: 005

Card 2/4

L 06231-67 EWT(m)/EWP(j) IJP(c) DJ/RM

ACC NR: AP6030659 SOURCE CODE: UR/0020/66/169/006/1370/1372

AUTHOR: Lur'ye, Ye. G.; Ratner, S. B.; Barshteyn, R. S.

ORG: State Scientific Research Institute of Plastics (Gosudarstvennyy nauchno-issledovatel'skiy institut plasticheskikh mass)

TITLE: The effect of the mechanism of plasticizing on the wear of polyvinyl chloride

SOURCE: AN SSSR. Doklady, v. 169, no. 6, 1966, 1370-1372

TOPIC TAGS: polyvinyl chloride, plasticizer, abrasion, chemical bonding

ABSTRACT: The purpose of this investigation was to determine the effect of the mechanism of plasticizing on the mechanical properties of polymers. Three systems were investigated: (a) polyvinyl chloride + 45% dioctylphthalate; (b) polyvinyl chloride + + 25% dioctylphthalate; (c) polyvinyl chloride + 25% polyester plasticizer. The obtained polymers were subjected to abrasion on a disc grinder against a metal grid. The temperature during experiments varied within 20-100°C. Destruction of polymers during abrasion is described by the following equation:

$$I = I_0 \exp\left[-\frac{U_0 - \lambda p_r}{RT}\right], \quad (1)$$

where T is the intensity of wear, p_r is the force per unit area of the specimen, U_0 is

UDC: 541.68

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L 06231-67
ACC NR: AP6030659

2

the energy of activation for the breakage of bonds and I_0 and λ are constants. The data obtained for the above three systems are shown in figure 1. It can be seen that U is a linear function of p_r. The extrapolation of U-p_r curves for all polymers produces a single y-intercept, corresponding to U_0 = 36 kcal/mol. This value is very close to the energy of activation for the breakage of the chemical bond during thermal destruction of polyvinyl chloride. Thus, U_0 is determined strictly by the strength of the chemical bond and does not change with the change in the type of plasticizer, which affects only the magnitude and the distribution of intermolecular bonds in the polymer. The values of I are determined from the slope of U-p_r curves, and are different for each of the three considered systems. Increases in the amount of plasticizer increas: λ. From equation (1), I approaches I_0 as $1/T$ approaches 0. The obtained data show, however, that $I=I_0$ at some finite temperature. At these temperatures, polymers cease to exist as solids. The authors thank S. I. Kovaleva and V. G. Gorbunova for their help in carrying out the experiments. Presented by Academician V. A. Kargin on 16 December 1965. Orig. art. has: 2 figures.

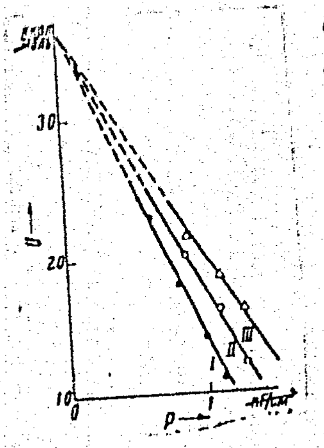

Fig. 1
Effect of specific pressure p_r on the effective energy of U. I--polyvinyl chloride + 45% dioctylphthalate; II--polyvinyl chloride + 25% dioctyl-

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L 06231-67

ACC NR: AP6030659

phthalate; III--polyvinyl chloride + 25% polyester plasticizer.

SUB CODE: 07,11/ SUBM DATE: 09Dec65/ ORIG REF: 011/ OTH REF: 001

Card 3/3

APPROVED FOR RELEASE: Tuesday, August 01, 2000 CIA-RDP86-00513R0014443

ACC NR: AP7002659 (A,N) SOURCE CODE: UR/0191/67/000/001/0064/0067

AUTHOR: Ratner, S. B.; Farberova, I. I.

ORG: none

TITLE: Influence of composition on the wear resistance of a plastic

SOURCE: Plasticheskiye massy, no. 1, 1967, 64-67

TOPIC TAGS: plastic, mechanical property, wear resistance, abrasive, hardness, ductility, friction coefficient, crystal orientation, chemical composition, polyethylene, epoxy resin, vinyl resin

ABSTRACT: The effect of composition on the wear resistance of a plastic was studied. Wear was related qualitatively to friction, strength, and ductility. Two types of wear were analyzed: ordinary wear due to repeated surface deformation, and abrasive wear due to microcutting of the surface. Equations were given for both types of wear. The temperature dependence of friction and wear were given for a vinyl plastic rubbed across steel. The wear rate of polyethylene and epoxy, abraded on a grating, was given as a function of temperature. The wear of vinyl and epoxy went through a maximum at 40°C and increased sharply above 60°C, while the abrasive wear rate of polyethylene only rose sharply above 120°C. Micrographs were shown of the abraded surfaces of rubber-resin composites for rubber contents of 20, 30, and 50%. Transverse ridges on surfaces itensified as the rubber content increased. Mechanical properties and wear

UDC: 678.01:539.538

Card 1/2

ACC NR: AP7002659

rates on both carborundum paper and metal grates were presented for a series of polyamides, polyphenols, halogen polymers, and other plastics. The wear resistance was directly related to $H\sigma\varepsilon/f$, where H is the Brinell hardness, σ is the strength, ε is the relative elongation to fracture, and f is the coefficient of friction at a load of 1 kg/cm^2. The abrasive wear rate of rubber-resin mixtures was a minimum at 40% rubber for abrasion on a grating, and at 60% rubber for wear on carborundum paper. Mechanical properties of AS salt-caprolactam mixtures were given as functions of the caprolactam content. The best wear endurance occurred at 10-25% caprolactam, corresponding to the highest strength and hardness. Orientation was induced in polypropylene and some polyamides by stretching, and the wear rates in the oriented and unoriented conditions were compared. The wear rate of oriented plastics was higher and increased linearly after 300% elongation as a function of deformation, irrespective of the type of material. Orig. art. has: 6 figures, 1 table, 3 formulas.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 011

Card 2/2

L 61462-65 EWT(m)/EPF(c)/EWG(v)/EPR/EWP(j)/T Pc-4/Pe-5/Pr-4/Ps-4 WW/JAJ/RM
ACCESSION NR: AP5012433 UR/0374/65/000/002/0118/0122
678:620.169

AUTHORS: Stinskas, A. V. (Moscow); Antropova, N. I. (Moscow); Korobov, V. I. (Moscow); Ratner, S. B. (Moscow); Samokhvalov, A. V. (Moscow); Sharova, A. V. (Moscow)

TITLE: On fatigue properties of capron and caprolon

SOURCE: Mekhanika polimerov, no. 2, 1965, 118-122

TOPIC TAGS: capron, fatigue strength, caprolon, polymer, plastic

ABSTRACT: The purpose of the investigation was to test the fatigue properties of two important thermoplastics which find wide application in the machine industry, i.e., capron and caprolon. Two varieties of caprolon were investigated: (A)- polymerized in presence of sodiumcaprolactam and acetic anhydride; (B)- polymerized in the presence of sodiumcaprolactam and carbon dioxide. Both varieties were compared with capron "B". The fatigue properties were determined at console buckling, frequency of 1000 cycles/min at 20C and at the temperature of self-heating. It was found that both caprolons had identical fatigue properties, and on the basis of 10^6 cycles both caprolons had a 70%, i.e., 300 kg/cm^2 greater fatigue

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L 61462-65
ACCESSION NR: AP5012433

strength than capron "B". The results of self-heating experiments are in complete agreement with those of S. B. Ranter and V. I. Korobov (Mekh. pol., 1965 (v. pechati)). The critical self-heating temperature for caprolon at 290 kg/cm² load and for capron at 165 kg/cm² load was found to be ΔTc 15C. The specimens undergo rapid destruction after reaching the critical temperature. The critical temperature was found to have a definite value and was independent of the load, the frequency, and heat removal. It is concluded that heat removal leads to an increase in the fatigue strength of both plastics. The fatigue strength of a caprolon specimen cooled by an air stream exhibited a 22% increase in fatigue strength. Orig. art. has: 2 tables and 3 graphs.

ASSOCIATION: none

SUBMITTED: 12Oct64 ENCL: 00 SUB CODE: MT

NO REF SOV: 007 OTHER: 000

Card 2/2

L 3564-66 EWT(d)/EWT(m)/EWP(w)/EPF(c)/EWP(j)/T EM/DJ/GS/RM
UR/0000/65/000/000/0156/0159
ACCESSION NR: AT5022673 34 30 B+1

AUTHORS: Ratner, S. B.; Klitenik, G. S.; Lur'ye, Ye. G.

TITLE: Wear of polymers as a process of fatigue damage

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya treniya i iznosa (Theory of friction and wear). Moscow, Izd-vo Nauka, 1965, 156-159

TOPIC TAGS: polymer, polymer wear, polymer fatigue, rubber wear, polymer friction

ABSTRACT: The effects of contact pressure and friction on the fatigue wear of polymers (as opposed to abrasive wear) were investigated. Based on the fatigue theory, the wear I for the case of elastic contacts can be expressed as

$$I = c/\sigma_0^t \cdot E^{\beta(1-\beta)-1} f^t p^{1+\beta t},$$

(I. V. Kragel'skiy and Ye. F. Nepomnyashchiy. Ob ustalostnom mekhanizme iznosa pri uprugom kontakte. Izv. AN SSSR, Mekhanika i mashinostroyeniye, 1963, No. 5) where β and C are characteristic of the surface roughness, t = constant characterizing the fatigue resistance of the rubber, according to

$$n = \left(\frac{\sigma_0}{\sigma}\right)^t = \left(\frac{\sigma_0}{kfp}\right)^t,$$

Card 1/2

(M. M. Reznikovskiy. Kauchuk i rezina. 1950, No. 9). Physically t has the meaning $t \simeq 3\lg n_{1/2}$ (where $n_{1/2}$ = number of cycles required to give half the polymer strength). The combined equations

$$I = I_1 p^{\alpha};$$

$$\alpha = 1 + \beta t = 1 + 3\lg n_{1/2}$$

were experimentally investigated, and it was found that $\alpha > 1$ while $\alpha = 1$ for abrasive wear. For 9 different polymers α was found to vary linearly from 0.9-4.0 as t increased from 0-60. It was also found that small changes in f lead to large changes in wear (see first equation above) with wear decreasing more with f for larger values of α (S. B. Ratner. Dokl. AN SSSR, 1963, 155, 848). Introduction of a lubricant results in increased wear, with I/I_{lub} almost linear with $\alpha_{lub} - \alpha$. Orig. art. has: 2 tables, 1 figure, and 6 formulas.

ASSOCIATION: Nauchnyy sovet po treniyu i smazkam, AN SSSR (Scientific Committee on Friction and Lubrication, AN SSSR) 44

SUBMITTED: 18May65 ENCL: 00 SUB CODE: MT, OC

NO REF SOV: 005 OTHER: 000

L 59226-65 EWT(m)/EPF(c)/EPR/EWP(j)/T Pc-4/Pr-4/Ps-4 WW/RM

ACCESSION NR: AP5016888 UR/0374/65/000/003/0093/0100
678:620.169

AUTHOR: Ratner, S.B.(Moscow); Korobov, V. I. (Moscow)

TITLE: Self-heating of plastics during cyclic deformation

SOURCE: Mekhanika polimerov, no. 3, 1965, 93-100

TOPIC TAGS: plastic self-heating, stationary zone, zone transition, cyclic deformation

ABSTRACT: Most plastics exhibit comparatively high hysteresis losses and low thermal conductivity, leading to significant self-heating during cyclic loading. Consequently, in view of the low thermal resistivity of plastics, the authors analyzed the process of self-heating due to the competing hysteresis heat generation and heat transfer to the surrounding media. They showed that there are two possible zones of stationary heating in polymers — one in the low temperature range corresponding to a high endurance of the material, and one at high temperature (which is often not achieved because of the sharp drop in the stability of plastics at such temperatures). At intermediate temperatures, no such stationary state is possible. As shown by theoretical and experimental investigations (covering 12 plastics), the transition from one stationary zone to the other occurs discontinuously, and the

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L 59226-65

ACCESSION NR: AP5016888

existence of either of the two zones is conditioned by the types of deformation (stress, frequency, sample dimensions, heat conductivity, etc.). However, the temperature at which such stationary states occur is independent of the deformation conditions and depends on the properties of the material only. Orig. art. has: 10 formulas, 4 figures, and 1 table.

ASSOCIATION: none

SUBMITTED: 09Nov64 ENCL: 00 SUB CODE: MT

NO REF SOV: 006 OTHER: 001

Card 2/2

FRENKEL', M.D.; RATNER, S.B.

Study of the brittleness temperature of plastics. Plast. massy no.4:39-44 '65. (MIRA 18:6)

RATNER, S.B.; KOROBOV, V.I.

Self-heating of polymers following repeated deformation. Dokl. AN SSSR 161 no.4:824-827 Ap '65. (MIRA 18:5)

1. Nauchno-issledovatel'skiy institut plasticheskikh mass.

CA

PROCESSES AND PROPERTIES INDEX

2

Calculation of the velocity of detonation in gases. Ya. B. Zel'dovich and S. B. Ratner. *J. Exptl. Theoret. Phys.* (U. S. S. R.) 11, 170-[illegible](1941).—Theoretical. An approx. relation between pressure, temp. and velocity of the detonation wave is derived. Thermodynamic calcns. for the detonation of $2H_2 + O$ and $H + Cl$ mixts. are compared with exptl. data. The heat of dissocn. of CO is calcd. to be over 210 kg.-cal. F. H. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

BC

A-1

Velocities of detonation of nitroglycerol and nitroglycol. J. B. Chariton and S. B. Ratner (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 41, 293—295).—There are two (or possibly three) discrete groups of velocities of detonation of nitroglycerol and nitroglycol. In both cases the two determined vals. are 1·8 ± 0·2 and 7·5 ± 1 km. per sec.; the higher velocity can change sharply into the lower. The probability of development of the higher velocity increases with the diameter of the tube. For narrow tubes the lower velocity alone occurs. The detonation stops abruptly when it has been propagated through a length of ~100 diameters in narrow tubes. In tubes of diameter >5 mm. no cessation of detonation was observed in a length of >1 m. Rapid propagation of detonation may be stimulated in narrower tubes by coupling them with wider ones and starting the detonation within the latter. On passing from wider tubes to very narrow ones, the rapid detonation changes sharply to the lower val. after a short distance. The propagation of the slower detonation may suddenly change to unstable propagation of flame. In nitroglycol the flame has a velocity of ~0·7 km. per sec.

A. J. M.

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

CA

24

Measurements of detonation velocity of $MeNO_2$. S. B. Ratner.—*Compt. rend. acad. sci. U. R. S. S.* 42, 265-7 (1944).—See *C. A.* 38, 6097[?]. R. H.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

Ca

24

Results of measuring the detonation velocity of methyl nitrate. S. D. Ratner. *Doklady Akad. Nauk S.S.S.R.* 42, 270-2(1944); cf. *C. A.* 38, 300; 35, 1974, and preceding abstr.—In complete analogy with results obtained with nitroglycerin and nitroglycol, the detonation velocity (*DV*) of $MeNO_3$ was 6.4 km./sec. and 1.5 km./sec., resp., when detonated in glass tubes of 8 mm. and 2.8 mm. inner diam. The *DV* of liquid nitro esters increases with their d., but is not detd. by their viscosity. The results tend to refute the hypothesis that nitro esters exist in two isomeric forms having different values of *DV*.

J. W. Perry

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

C/1

2

Computation of the characteristics of a detonation wave propagated as a stationary wave through condensed explosives and the equation of state for the products of explosion. S. B. Ratner. *Compt. rend. acad. sci. U.R.S.S.* 48, 187-90(1945). The equations of the hydrodynamic theory are solved by using van der Waals' equation of state and expressing the co-vol. in the form proposed by van Laar. The consts. of the equation of state for the explosion products are calcd. from exptl. data for the relation between the velocity of detonation of PETN and its d. Comparison with Bridgeman's exptl. data (*The Physics of High Pressure*, p. 101, (C.A. 26, 1505)) indicates that at high d. it is necessary to take into account forces of repulsion. Thus the form of the equation of state adopted in R.'s calcns. [$p = RT\varphi(v)$] cannot reflect the properties of the explosive products if the initial d. of the explosive is large. Frank Gonet

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Cd

24

Volatilization of aluminum oxide in the detonation wave. S. B. Ratner and Yu. B. Khariton. *J. Phys. Chem. (U.S.S.R.)* 20, 221-2(1946).—Al raises the blasting power but does not affect the brisance of explosives if its concn. is 20%. Smaller addns. of Al (5-10%) also raise the brisance of NH_4NO_3. Probably large amts. of Al do not increase the brisance because the volatilization of Al_2O_3 absorbs heat. When the detonation products expand and their temp. drops, the Al_2O_3 vapor condenses and its latent heat of vaporization is liberated; this enhances the blasting effect. J. J. Bikerman

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

2

Fifteen years of activity of the Institute of Chemical Physics, Academy of Sciences, U.S.S.R. S. R. Rainst. *J. Phys. Chem.* (U.S.S.R.) 20, 1223-9(1946)(in Russian). —Historical. J. J. Bikerman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA

24

PROCESSES AND PROPERTIES INDEX

The mechanism of detonation of liquid explosives. An estimation of the temperature rise of liquid nitrates in the shock wave. S. B. Ratner (Inst. Chem. Phys., Acad. Sci. U.S.S.R., Moscow). *J. Phys. Chem.* (U.S.S.R.) **20**, 1377–81(1946)(in Russian).—The temp. of nitroglycerin in which a shock wave progresses, is calcd. It can reach 3000° and, consequently, is sufficient for propagation of the wave. J. J. Bikerman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

RATNER, S.

PA 9T16

USSR/Explosives, Liquid — Feb 1947
Shock waves - Thermodynamics

"On the Detonation Mechanism of Liquid Explosives: An Estimate of the Heating of Liquid Nitric Esters in a Shock Wave," S. Ratner, 6 pp

"Acta Physicochimica" Vol XXII, No 2 - pp. 357-62

Estimation of the temperature, pressure and density of undecomposed liquid nitric esters (nitroglycerine, etc.) compressed by the shock wave in the course of the steady propagation of detonation to determine whether the extent to which condensed explosives are compressible by a shock wave is such that the resulting temperature is able to ensure a sufficiently rapid reaction. 9T16

PROCESSES AND PROPERTIES INDEX

2117. **Photographic recording of an explosion wave formed outside a linear charge (h.e.).** S. B. Ratner. *J. Tech. Phys., USSR*, 20 (No. 12) 1422-5 (1951) [illegible] Russian

Two parallel overlapping glass plates a few cm apart were placed alongside a cylindrical explosive charge, the plane of the plates being inclined at about 30° to the charge axis. The light emitted by the detonating explosive was recorded by means of a rotating drum camera. Intense light emission occurred from the detonation wave and from impact of the accompanying shock-wave on the glass plates. The time between emergence of light from the explosive and from corresponding points on the plates may be estimated from the photographic records; the author uses such measurements to deduce the velocity and shape of the shock wave. It is found that for nitroglycerine and hexogen the shock velocity is between 2,500 and 4,000 m/sec and that the wave front is inclined to the normal to the charge surface by 10-30°, the direction of inclination being away from the point of initiation. From the fact that the shock-velocity remains nearly const. over a radial distance ~ the charge radius, it is concluded that the shock front is composed of particles of undetonated explosive originating in a surface layer approx. 1 mm thick. A. Schmoelle

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

KOMPANEYETS, Aleksandr Solomonovich; RATNER, S.B., redaktor; TUMARKINA, N.A., tekhnicheskiy redaktor

[Theoretical physics] Teoreticheskaia fizika. Izd. 2-oe, perer. i dop. Moskva, Gos.izd-vo tekhniko-teoret. lit-ry, 1957. 563 p. (Physics) (MLRA 10:9)

RATNER, S.

High-Strength 18/8 Stainless Steel Wire for Cables. F. Khimushin, S. Ratner and Z. Rudbakh. (Stal, 1939, No. 8, pp. 40–46). (In Russian). Earlier work and recommendations regarding the drawing, heat treatment, pickling, lubrication and polishing of stainless-steel wire are critically summarised. Regarding intermediate annealing, the authors point out that a "recovery" anneal at 820–850° C. is preferable to the high-temperature (925–955° C.) annealing which has been suggested. The lower temperature reduces scaling losses. The two steels used in the investigations were *EYa1* and *EYa2*, containing carbon 0·10% and 0·10%, silicon 0·37% and 0·58%, chromium 17·05% and 17·35%, and nickel 8·92% and 9·40%, respectively. A very wide study was made of the effect of the wire-drawing and heat-treatment schedules on the properties of the wire obtained, which included the tensile strength, ductility, resistance to torsion, hardness and magnetic properties. The question of lubrication and, in conclusion, the tensile and fatigue strength of cables receive some mention. The best method of wire-drawing was found to be to use total drafts of 55–60% (individual drafts of 20–30%), except for the final draft, with intermediate anneals at 840–860° C. Before finish-drawing, the wire was quenched from 1100–1150° C., and the final drawing was effected with individual drafts of 10% and a total of 93–94% reduction. Wire produced in this way had a tensile strength of 240–260 kg. per sq. mm. and in general was equal to imported American wire. The above very large drafts and the resulting mechanical properties could be obtained only by using a zinc coating as a lubricant. The use of steel *EYa1* with the lower carbon content was preferable. The zinc coating was removed by pickling in weak acid and the wire was polished by drawing.

RATNER, S.

196/111 621.791.3 :620.172 Zh. tekh. Fiz. 24(8), 1455-1466 1954

The Effect of Molten Solder on the Strength of Metal

S.T. Kishkin, V.V. Nikolenko, S. . Ratner U.S.S.R.

Two sets of experiments were carried out with five grades of steel and four types of solder (specified): (i) Tensile tests with solder covered specimens on a 10-ton tensile machine and (ii) Application of solder on the specimen subjected to tensile stress. The results are discussed in considerable detail. To reduce the possibility of ensuing cold brittleness of soldered metal it is recommended that copper or nickel coating prior to soldering, as well as Pb-Ag solder should be used. Care also should be taken to avoid stresses, both internal and external, at the joints to be soldered, while soldering itself should be done with as little heating up as possible. (Bibl.4)

RATNER, Solomon Davidovich

Voprosy Opredeleniya Effektivnosti Ispol'Zovaniya Oborotnykh spredstv promyshelnnykh Predpriyatiy (Problems Determining the effectiveness of working capital in industrial enterprises) Moskva, Gosfinizdat, 1956.
81 P. Tables.
Bibliographical Footnotes.

PROCESSES AND PROPERTIES INDEX

CA

11F

Action of the thyrotropic hormone of the anterior lobe of the pituitary body on the animal organism. C. I. Ratner. *Problemy Endokrinol.* 2, 175-94(1937); *Chem. Zentr.* 1938, I, 4487.—The influence of the thyrotropic hormone on the thyroid gland and on the protein, carbohydrate and I metabolism of guinea pigs and dogs was studied. The daily dose was 5 units for guinea pigs and 25 units for dogs. An increase in post-mortem autolysis was observed. There was also a sharp decrease in the liver glycogen which persisted up to the 12th injection, after which this substance increased again up to normal. The blood sugar was not essentially changed. In dogs the I content of the blood increased up to the 10th injection and then decreased to normal. Changes in the histological picture of the thyroid showed the same regularity, which indicated a close relationship to the metabolic changes. The latter, therefore, are to be regarded as a result of a hyperfunctioning of the thyroid, which under long continued influence of the thyrotropic hormone becomes insensitive to it. M. G. Moore

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

RATNER, S. I.

27367. RATNER, S. I. Voprosy Kliniki I lecheniya bakterial'noy dizenterii. Klinich. Meditsina, 1949, No. 8, s. 3-15.--Bibliogr: s. 15

SO: Letopis' Zhurnal'nykh Statey, Vol. 36, 1949

RATNER, S.I., professor.

Rectoromanoscopy in dysentery. Terap.arkh. 25 no.2:87 Mr-Ap '53.
(MLRA 6:5)
(Dysentery)

RATNER, S.I.

RUBINSHTEYN, B.N., professor; RUDNEV, G.P., professor, chlen-korrespondent; KHARIN, Yu.M.; KHASHIMOV, D.; LUKOMSKIY, P.Ye., professor; BILIBIN, A.F., professor; RATNER, S.I., professor.

Modern treatment of dysentery. Terap.arkh. 25 no.2:87-89 Mr-Ap '53. (MLRA 6:5)
(Dysentery)

RATNER, S.I., professor (Moskva)

Influenza and its prevention. Med.sestra no.5:11-14 My '55.
(INFLUENZA, prev. and control) (MLRA 8:6)

RATNER, S.I., Prof; BRUSHLINSKAYA, N.G.; MAYORCHUK, D.P.; KOMOLOVA, R.P., (Moscow)

Clinical aspects of ornithosis in man. Klin.med.33 no.5:34-41 My '55. (MLRA 8:9)

1. Iz infektsionnogo otdeleniya bol'nitsy imeni S.P. Botkina (Nauchnyy rukovoditel' prof. S. I. Ratner, glavnyy vrach -- prof. A.N. Shabanov, zam.glavnogo vracha po infektsii--zasluzhennyy vrach RSFSR A.N. Buznikov)

(ORNITHOSIS
clin.aspects)
(LUNGS, in various dis.)
ornithosis)

RATNER, S.I., professor

Dysentery and its control. Med.sestra 15 no.7:19-21 Jl '56.
(DYSENTERY) (MLRA 9:10)

RATNER, S.I., professor; KOROLEV, G.P.; GUBIN, G.N.; KOMOLOVA, R.P.

A case of foot-and-mouth disease of prolonged duration in man. Klin. med. 34 no.7:70-77 Jl '56. (MLRA 9:10)

1. Iz infektsionnogo otdeleniya Klinicheskoy ordena Lenina bol'nitsy imeni S.P.Botkina (nauchnyy rukovoditel' - prof. S.I.Ratner, glavnyy vrach - prof. A.N.Shabanov), Nauchno-proizvodstvennoy laboratorii Ministerstva sovkhozov RSFSR i Yashchurnoy laboratorii Vsesoyuznogo instituta eksperimental'noy veterinarii (dir. - prof. N.I.Leonov)
(FOOT-AND-MOUTH DISEASE, case reports
in man, prolonged duration)

RATNER, S.I., prof. (Moskva)

Colitis. Med.sestra 16 no.8:6-10 Ag '57. (MIRA 10:12)
(STOMACH--DISEASES)

RATNER, S.I., professor

"How to protect oneself and others from dysentery and typhoid fever" by G.M.Vaindrakh. Reviewed by S.I.Ratner. Sov.med. 21 no.2:143-144 F '57. (MLRA 10:6)
(DYSENTERY) (TYPHOID FEVER) (VAINDRAKH, G.M.)

RATNER, S. I., prof. (Moscow)

Dysentery and its control. Med.sestra 17 no.7:23-25 Jl '58
(MIRA 11:7)

(DYSENTERY)

LEYRIKH, Valentin Emil'yevich, kandidat tekhnicheskikh nauk; RATNER, Sulamif' Isidorovna, inzhener; UDAL'TSOV, A.N., glavnyy redaktor; CHAPLYGIN, D.V., inzhener, redaktor

[Concrete for light petroleum products for nonmetallic reservoirs] Betony dlia nemetallicheskikh emkostei pod legkie nefteprodukty. Tema 39, no.1-56-54. Moskva, Akad. nauk SSSR, 1956. 23 p. (MLRA 10:5)

(Concrete construction) (Petroleum products--Storage)

VIL'SHANSKAYA, F.L.; RATNER, S.I.

Characteristics of intestinal microflora in chronic colitis before treatment and in the process of treatment with dry colibacterin; author's abstract. Zhur. mikrobiol., epid. i immun. 4 no.1:91 Ja '64. (MIRA 18:2)

1. Moskovskiy institut epidemiologii i mikrobiologii i Moskovskaya bol'nitsa imeni Botkina.

RATNER, S.I., prof.; FAYN, O.I.; MASHILOV, V.P.; MITROFANOVA, V.G.; KHUDYAKOVA, G.K.; VIL'SHANSKAYA, F.L., kand. med. nauk (Moskva)

Treatment of nonspecific ulcerous colitis with dried colibacterin. Klin. med. 41 no.2:109-115 F'63 (MIRA 17:3)

1. Iz Moskovskoy bol'nitsy imeni S.P. Botkina i Moskovskogo nauchno-issledovatel'skogo instituta epidemiologii i mikrobiologii Ministerstva zdravookhraneniya RSFSR.