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LITERATURE SEARCH
on
DAMPING PROPERTIES OF POLYURETHANE FOAM

by
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DEPARTMENT OF DEFENSE
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PLASTEC 3549-14

Olevitch, Albert and W.J. Trapp. (AF-Wright Air Development Center).
 "Shock and vibration absorption." In: AIR RESEARCH AND DEVELOPMENT COMMAND
 TECHNICAL SYMPOSIUM - MATERIALS RESEARCH, DEVELOPMENT AND APPLICATION, Dallas,
 Texas, 9-10 July 1958. Sponsored by AF-Air Research and Development Command.
 pp. 255-268.

Damping - acoustic energy

This has been withdrawn and discarded, so it could not be evaluated.

PLASTEC 3618-1

Centraal Laboratorium T.N.O.
 MECHANICAL PROPERTIES OF HIGHLY FILLED ELASTOMERS, by F. R. Schwarzl. July 1962,
 Report CL/62/44. Navy contract N 62558-2822.

Damping - urethane

This has been withdrawn and discarded, so it could not be evaluated.

PLASTEC 3618-2

Centraal Laboratorium T.N.O.
 MECHANICAL PROPERTIES OF HIGHLY FILLED ELASTOMERS. II. INFLUENCE OF PARTICLE
 SIZE AND CONTENT OF FILLER ON TENSILE PROPERTIES AND SHEAR MODULI, by F. R.
 Schwarzl. 4 April 1963. Report CL/63/41. Navy contracts N 62558-2822 and
 N 62558-3243.

Damping - urethane

This has been withdrawn and discarded, so it could not be evaluated.

PLASTEC 8691

Raphael Thomas and C. D. Armeniades. (Arthur D. Little, Inc.).
 "Correlation of rebound tester and torsion pendulum data on polymer samples." In:
 PROCEEDINGS OF THE ANNUAL TECHNICAL CONFERENCE, 22nd, Montreal, 7-10 March 1966.
 Technical papers, volume 12. Sponsored by the Society of Plastics Engineers, Inc.
 Paper X-4, pp. 1-4

This paper correlates the dynamic test data obtained by the ADL Ball Rebound Tester
 on six different types of plastics with torsion pendulum data reported previously by
 the participants of a round robin test program of ASTM D-20, Subcommittee I-0 on
 Dynamic Testing. It also discusses briefly the differences between the two testing
 techniques and their effect on the data. (Author)

See PLASTEC 2491-66.

Damping - various plastics.

No polyurethane. Covers PP, CAB, glass-filled epoxy,
 PS, PVC, Teflon.



PLASTECH 8910

Pittsburgh University.

AN EXPERIMENTAL INVESTIGATION OF THE MECHANICAL PROPERTIES OF A SELECTED GROUP OF PLASTIC MATERIALS, by W.M. Laird and others. No date. Contractor report CR-71897. NASA grant Nsg-631.

A selected group of plastics was subjected to static and dynamic tests to determine the behavior of their mechanical properties. The materials selected were those which, it was believed, would exhibit reasonably linear elastic properties. Stress-strain curves and associated information were obtained from conventional tensile tests according to ASTM Standards. Dynamic behavior was investigated over a range of temperatures and frequencies by observing the vibration characteristics of cantilever beam specimens. The dynamic tests also provided information on the log-decrement damping characteristics of the materials. (Author, modified)

Damping - various plastics.

68 pp.

Figures and table on Log-decrement damping characteristics (of 11 plastics).

No polyurethane.

PLASTECH 8944

Minnesota University.

A GRAPHICAL COMPILATION OF DAMPING PROPERTIES OF BOTH METALLIC AND NON-METALLIC MATERIALS, by L.T. Lee. May 1966. Technical report AFML-TR-66-169. Period: June 1963 - February 1966. AF contract AF 33(615)-1055. AF project 7351; task 735106. AD-486 490.

This report is a compilation of data on the damping properties of uniform materials and test specimens that has been collected from a wide range of publications. There are 420 entries on metals and alloys of which 300 are also illustrated with figures. There are 250 entries on polymers, elastomers, wood products, composites and similar synthetic and natural nonmetallic materials of which 85 are illustrated with figures. There are 80 entries on refractories, glass, masonry, minerals, stone, natural crystals, and oxides of which 20 are illustrated with figures. The data for the polymers and elastomers is usually given in complex notation (G' , G'' or E' , E''). The primary purpose of this report is to present conveniently and concisely a compilation of published test data in a consistent set of units and to provide a useful reference for engineers and designers. (Author, modified)

Damping - various plastics.

An excellent source. 210 pp.

Includes urethane rubber, 3M double-coated polyurethane foam tape, 4000 series. Has 250 entries on polymers, elastomers, wood products, composites, etc. (i.e. non-metallics).



Documents

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PLASTEC 9120

Mendelsohn, M.A. and others. (Westinghouse R and D Center).

"Effect of chemical composition on the physical properties of a high load bearing flexible polyurethane foam." In: PAPERS PRESENTED AT THE DETROIT MEETING, April 1965. Sponsored by the American Chemical Society - Division of Organic Coatings and Plastics Chemistry. Volume 25, number 1. pp. 85-94.

A polyurethane foam was designed for a packaging application involving protection of certain instruments against shock and various lower frequency vibrational motions that occur during their conveyance. The most salient features of the requisite engineering specifications require that the foam have high load bearing properties, good resilience or quick recovery from distortion, a moderate tensile strength, good breathability, low glass transition temperature and high hydrolytic stability. (Authors', modified)

See PLASTEC 2532-A65.

Damping - urethane foam.

Not much value. Has packaging foams (i.e. low density).

Can't find damping material despite key words.

PLASTEC 9567

Volz, W.A. (Westinghouse Electric Corporation).

"Application of polyurethane foam to shock isolation of large silo-based missiles."

In: SYMPOSIUM ON SHOCK AND VIBRATION, 36th, Los Angeles, California, 18-20 October 1966. Sponsored by the Office of the Director of Defense Research and Engineering. January 1967. Bulletin 36, part 2. pp. 89-95.

The highlights of a foam isolator feasibility study, recently completed under an Air Force contract, are presented. The program included analysis and design studies followed by tests on a full-diameter isolator. (Author, modified).

See PLASTEC 9563-2.

In the last few years there has been considerable interest in the application of flexible polyurethane foam to the shock isolation of large silo-based missiles. This is due to the inherent suitability of this material for use in annular configurations and the high space efficiency (ratio of rattle space to the envelope needed for the isolator) that can be achieved. The highlights of a foam isolator feasibility study, recently completed under an Air Force contract, are presented. The program included analysis and design studies followed by tests on a full-diameter isolator. One of the primary goals of this study was to develop and evaluate the analytical tools needed to design a foam shock mount and predict its performance. These analytical methods are the key to transforming foam into an engineering material which is useful and predictable as a shock mount. The paper includes a description of the shock isolator concept considered in the study, a discussion of fundamental foam characteristics, a description of the mathematical model used and the tests run, and a discussion of typical test results.

Flexible (elastic) polyurethane foam (2-8 pcf density); some data, pretty general. No damping key words. This reference appeared to be of possible interest.



Documents

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PLASTEC 9568

Owens, F.S. (AF-Materials Laboratory).

"Elastomers for damping over wide temperature ranges." In: SYMPOSIUM ON SHOCK AND VIBRATION, 36th, Los Angeles, California, 18-20 October 1966. Sponsored by the Director of Defense Research and Engineering. January 1967. Bulletin 36, part 4. pp. 25-35.

The use of viscoelastic materials for structural damping on aircraft and missiles has been unduly limited because of the temperature sensitivity of these materials. The experimental work here described demonstrates a technique for extending the temperature range over which these materials have useful damping. (Author, modified).

See PLASTEC 9563-4.

The use of viscoelastic materials for structural damping on aircraft and missiles has been unduly limited because of the temperature sensitivity of these materials. The experimental work here described demonstrates a technique for extending the temperature range over which these materials have useful damping. The approach is based on the phenomenon that viscoelastic polymers exhibit a high level of damping only within a few degrees of their glass transition temperatures and that certain types of polymer blends exhibit more than one glass transition temperature. The dynamic response of blends of polyvinyl acetate and polystyrene with a styrene-butadiene and a nitrile-butadiene rubber were investigated over temperature ranges including all the glass transitions of the polymers used in the blends. The polyvinyl acetate-polystyrene-nitrile rubber blend and the polystyrene-nitrile rubber blend both met the target properties of having a loss factor of 0.1 or more and a modulus of 10^4 psi over a 200°F range. The three polymer blends had a higher level of damping over a wider temperature range than the two polymer blends, and the two polymer blends were better than the base elastomers. Further improvements in high temperature damping materials are anticipated through the use of the fundamental concepts demonstrated in this research effort.

Damping - various plastics,
No polyurethane.



Documents
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PLASTEC 9681

Battelle Memorial Institute.

DAMPING CAPACITY OF MATERIALS: VOLUME 1, by R.E. Maringer. 3 January 1966.
Report RSIC-508. Period: 1955-1965. Army contract DA-01-021-AMC-11706 (2).
AD-640 465.

This report contains a brief introduction to the field of damping capacity in materials and an extensive, annotated bibliography. The introductory material presents the fundamentals of damping, general methods of measuring internal friction or damping capacity, and some representative damping properties. The bibliography contains over 2300 references to pertinent literature published from 1955 through 1965, and is cross-indexed by both author and subject. (Author's, modified)

Damping - various materials.
381 pp., mostly on metals.

PLASTEC 10334

Royal Aircraft Establishment.

STIFFNESS, DAMPING AND CREEP PROPERTIES OF A POLYURETHANE FOAM
INCLUDING THE EFFECTS OF TEMPERATURE AND HUMIDITY, by D.B. Payen.
August 1965. Technical report 65198. AD-476 581.

Experiments have been made to establish the physical properties of a flexible polyurethane foam used in the construction of aeroelastic models for use in low-speed wind tunnels. Simple static and dynamic bending tests were made on a composite cantilever of plastic foam and a light alloy bar. It is shown that dynamic stiffness and damping capacity measurements must take account of temperature and absolute humidity, and that the dynamic stiffness is almost double the static value. Other phenomena such as creep and the effect of "working" are discussed.
(Author's)

PLASTEC 10261

Ministry of Aviation.

STIFFNESS, DAMPING AND CREEP PROPERTIES OF A POLYURETHANE FOAM
INCLUDING THE EFFECTS OF TEMPERATURE AND HUMIDITY, by D.B. Payen.
1967. Report C.P. 905. AD-809 762.

Damping - urethane.

Good; these two PLASTEC numbers (10261 and 10334 apparently are for the same report, so they are combined here; PLASTEC 10261 is now being withdrawn).



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