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Brief 64-10068

NASA TECH BRIEF

Mechanical Properties of Plastics Predetermined by Empirical Method

The problem: To develop a method for predetermining the mechanical properties of rigid plastics as a function of plasticizer content and composition. Knowledge of the functional dependence of such factors as environmental temperature and vacuum conditions, ultraviolet irradiation, and strain rate on plasticizer parameters of various plastics would enable designers to select the materials best suited to particular applications.

The solution: A set of empirically derived equations that relate strain rate, yield stress, temperature, and weight fraction of plasticizer.

How it's done: Experiments were performed with 1/32-inch polymethylmethacrylate sheet stock. Equations were derived from plots of the dependent vs independent variables. These equations can be used to predict the yield stress of polymethylmethacrylate at strain rates that cannot be readily applied in tests or to design for specific yield stresses. The equations are applicable for yield stresses from 3,000 to 19,000 psi for any combinations of strain rate, temperature, and plasticizer content (methylmethacrylate or dibutylphthalate) within the range of temperatures from -25° C to 100° C and plasticizer weight ratios from 0 to 0.20.

Note:

Further information concerning this innovation is described in a paper entitled "The Combined Effects of Ultraviolet Radiation and Vacuum on the Tensile Yield Properties of Polymethylmethacrylate" by Jerome J. Lohr and John A. Parker, presented at the New York meeting of the American Chemical Society, Division of Polymer Chemistry, September 1963. Inquiries may be directed to:

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Reference: B64-10068

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Jerome J. Lohr and John A. Parker
(ARC-28)