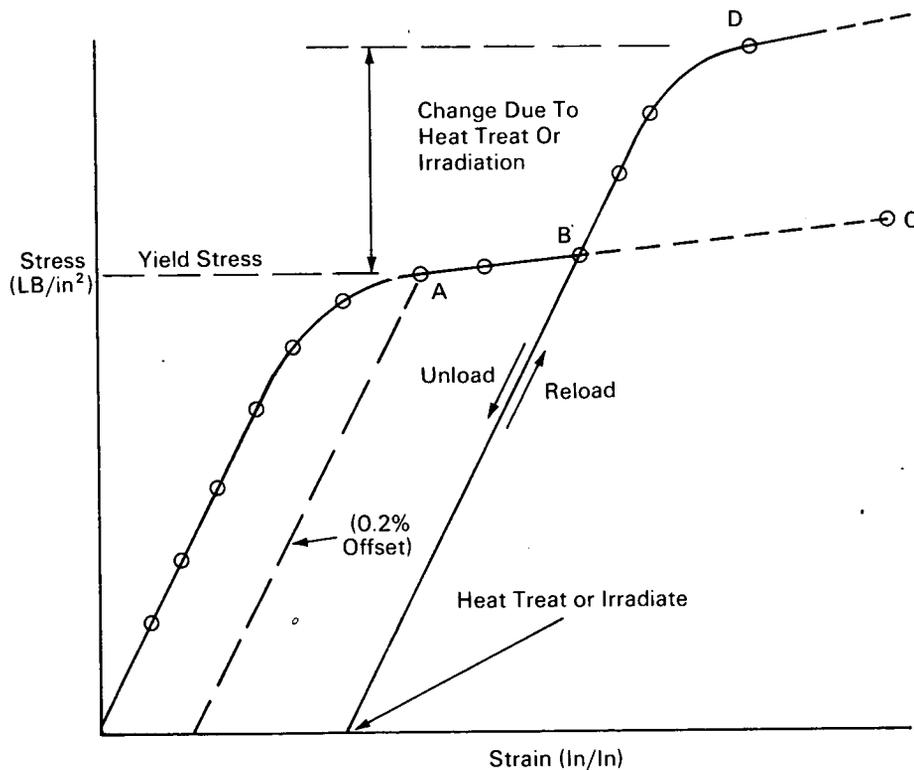


AEC-NASA TECH BRIEF



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Simplified Method Measures Changes in Tensile Yield Strength Using Least Number of Specimens



The problem:

In determining the change in yield strength due to heat treat, irradiation or mechanical treatment, it is common practice to use separate groups of specimens of each material for each test. For example, several specimens of each material are selected for testing before any treatment is made and separate specimens of each material are selected for testing after each treatment or combination of treatments is made. This

method requires many specimens and is costly. In a recent testing situation, because only a few samples were available, another method had to be implemented.

The solution:

Within a group of specimens start the stress-strain test of each specimen. After the yield stress point has been established, unload the specimen and apply the heat treat or irradiation. Reload the specimen and

(continued overleaf)

establish the new yield stress point which is a measure of the change in material due to heat treat or irradiation.

How it's done:

A group of specimens is tested in the following manner (the larger the group, the greater the confidence in the results): With a specimen, start the stress-strain test and establish each point on the curve up to its yield stress point (point A on the curve). At some point beyond the yield stress point (point B) but much less than the predicted ultimate stress point (point C) unload the specimen and expose it to the desired heat treat or irradiation. Reload the specimen and establish the new yield stress point in the same manner as before (point D).

It has been found that the change in tensile yield stress, as shown, can be measured accurately. Other tensile properties can still be obtained with the same specimen. Recovery studies of induced changes in yield strength can be made by unloading just after point D, annealing, and repeating the measurements at the regular testing temperature. For a highly ductile material, possibly 4 or 5 annealing temperatures could be investigated with the same specimen.

Notes:

1. Formerly it was required to have several groups of specimens for each material being tested. With this method of testing, it is normally required to have only one group of specimens. This provided for a marked decrease in cost of specimens from 50% upward, depending upon the number of different conditions under which the material is to be tested.
2. Inquiries concerning this innovation may be directed to:

AEC-NASA Space Nuclear Propulsion
Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
Reference: B67-10266

Patent status:

No patent action is contemplated by AEC or NASA.

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