REFERENCE

WANL-TMI-1672

From: Engineering Mechanics

Date: April 27, 1966

Subject: Notch Tensile Strength of
Beryllium at 140°R (EML-82)

WESTINGHOUSE ASTRONUCLEAR LABORATORY

Bifano, N. J.
Brussalis, W. G.
Eggers, A. G.
Esselman, W. H.
Faught, H. F.
French, J. W.

Layland, E. L.
Miller, D. F.
Nadler, R. A.
Pianka, E. W.
Retallick, F. D.
Roman, W. G.

MASTER

Rowan, W. J.
Schreiber, J. J.
Spurrier, F. R.
Thompson, D. C.
Watjen, E. A.
Library (2) ←

A tensile test on a notched beryllium specimen was performed to obtain data which will be used in establishing strain limits for scheduled tension-compression strain cycling tests on similar specimens. The following results were obtained:

- 1) Notched T. S. at 140°R = 20,600 psi
- 2) Modulus of Elasticity at 140°R $\approx 40.0 \times 10^6$ psi
- 3) Stress-strain at major diameter is linear to fracture (10,300 psi)

The specimen (Dwg. 800C414-HO3) gage section was 0.750 inches in diameter and 4 inches long. A 60° V-notch with root radius of 0.004 inches was machined in the center of the gage length. The notch radius was sized and polished with a wire and abrasive slurry. The root diameter of the notch was 0.5322 resulting in a K_t factor of 6.5. Figure 1 shows the broken specimen along with an untested specimen.

Special adapters were machined for the 2-1/2 inch threaded ends of the specimen with extra precautions being taken to obtain concentricity of the loading threads. The pull rod linkage in the Wiedemann Testing Machine included universal joints and spherical washers at each end.

To check the alignment, 4 strain gages were mounted on the major diameter of the specimen. These were spaced 90° apart 1-1/2 inches from the notch. The alignment check was carried out at ambient temperature since no adjustments could be made after the specimen was submerged in LN₂. With room temperature loading to 1000 lbs, the indicated bending was approximately 4 and 2 per cent in the two strain gage planes.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

INFORMATION CATEGORY

Unclassified
N. J. Bifano 4/28/66
Authorized Classifier Date

DISTRIBUTION OF THIS DOCUMENT UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

A load of approximately 100 lbs was maintained on the specimen while cooling down to LN₂. Compensating gages mounted on an unnotched specimen were also immersed in LN₂. The 4 gages were connected to 4 separate X-Y plotters. Loading rate to fracture was maintained at approximately 350 lbs per minute.

Failure occurred in the notch at a load of 4585 lbs for a notch tensile strength of 20,600 psi. Unfortunately only two of the strain gages functioned properly in the LN₂, and these were in planes 90° apart, so no indication could be obtained of the actual bending. However, it was concluded from the stress-strain curve slopes that 3 to 5 per cent bending was present.

T. F. Hengstenberg
Reactor Assembly and Dynamics
Experiments

Approved by:

N. J. Bifano, Supervisor
Support Structure and Cryogenic
Experiments

/cam

Attachment

FIGURE 1
BROKEN AND UNBROKEN SAMPLE OF
NOTCHED BERYLLIUM SPECIMEN