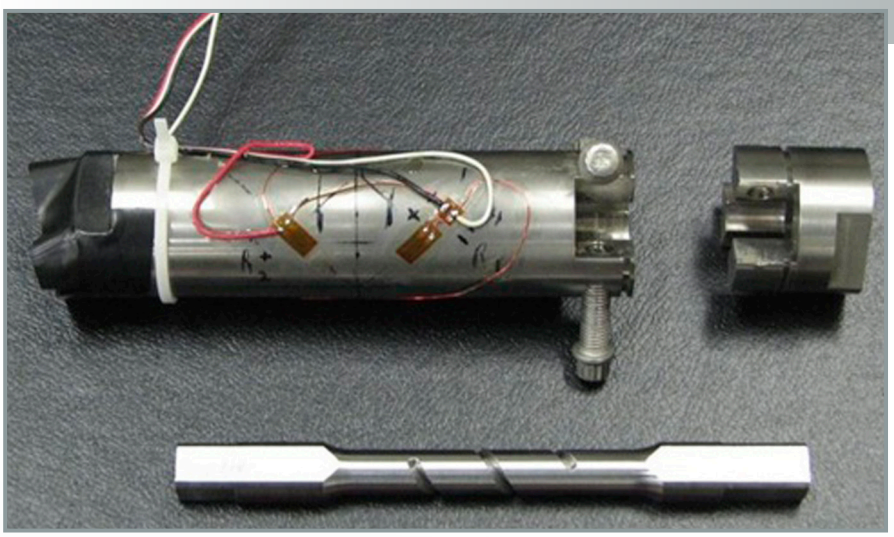
# Apparatus for Pre-stressing Specimens in Torsion for In Situ Fracture Toughness Testing in a High-Pressure Hydrogen Environments

UT-B ID 200701992



## Technology Summary

To assess the impact of a specific stress range in torsion, ORNL researchers developed an apparatus to pre-stress a strain-gaged rod-shaped specimen. The complete assembly can be used for in situ testing in an environmental chamber charged with an extremely high pressure gas environment (e.g., hydrogen).

This invention presents important advantages for evaluation of the fracture toughness of materials and offers new information for projects in energy development. The influence of hydrogen on the crack behavior of welds is virtually unknown with conventional methods. In situ testing in small controlled environments is another key feature unavailable with current methods. The apparatus can be applied to the investigation of hydrogen embrittlement in pipeline steel or other alternative energy initiatives, and for advanced material development.

The invention's spiral-notch torsion test system includes a helical groove with a 45 degree pitch to simulate fracture behavior of a thick compact tension specimen. In addition, the test method supports small volume test specimens and facilitates the testing of textured materials in any orientation.

## Advantages

- In situ torsion investigations
- Independence of size effect
- Small volume specimen
- Ease of testing textured materials in any desired orientation

## Potential Applications

- Compact tension specimen testing
- Investigation of hydrogen embrittlement
- Advanced material development

## Patent

Jy-An Wang, Ken C. Liu, and Zhili Feng, *Apparatuses for Pre-stressing Rod-type Specimens in Torsion for In-situ Passive Fracture Toughness Testing in an Extremely High-pressure Environment of Hydrogen,* U.S. Patent Application 12/498,799, filed July 7, 2010.

## Lead Inventor

Jy-An Wang
Materials Science and Technology Division
Oak Ridge National Laboratory

## Licensing Contact

Alexander G. DeTrana
Technology Commercialization Manager,
Materials Science
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865.576.9682
E-mail: detranaag@ornl.gov

PARTNERSHIPS