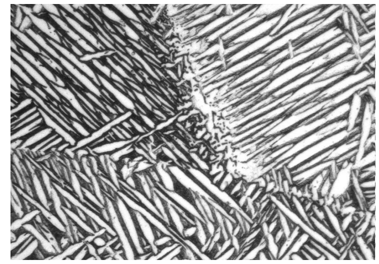
SUPERPLASTICITY OF TITANIUM ALLOY

TECHNOLOGY OVERVIEW



The technology is a titanium based alloy that has the ability to undergo large plastic deformation in tension without failure or fatigue. This alloy has the similar tension characterists as materials that have a plastic deformation above 200% and a grain size of less than 10 µm. Typically, titanium alloys do not exhibit fine-grain superplasticity in the beta phase field due to rapid grain growth. In this technology, superplasticity can be achieved by an addition of one compound. The new alloy restricts the beta growth and stabilizes a fine, equiaxed beta grain size at the deformation temperature, thereby enabling superplasticity. The new strain rates are of a magnitude of 2 – 3 times higher when compared to conventional superplasticity. The adjoining diagram shows the microstructure of the titanium alloy.

POTENTIAL FIELDS OF USE

The technology may be highly beneficial in various types of manufacturering industries, such as aerospace, aviation, transportation, and other industries that involve metalworking and lightweight materials. The US market for these combined industries are estimated to be over $85 billion and expected to grow by more than 25% through 2012. Within these markets, the demand in strong, lightweight materials that have superplasticity characterists, are expected to grow at a higher rate than the general market.

BENEFIT ANALYSIS

The titanium based alloy has several benefits over existing technologies:

- Ability to form intricate shapes not possible by other approaches or techniques.
- Higher production rates than conventional superplasticity materials.
- Lower manufacturing and equipment costs to produce materials of the same technical specifications.
- Ability to form near-net/net shapes with enhanced mechanical properties on smaller capacity presses.
- Improved chemical homogeneity due to enhanced diffusion rates.
- Reduced processing and production costs and improved performance with strength, stiffness and microstructure.

STAGE OF DEVELOPMENT

Several validation experiments were conducted in the laboratory to test the occurrence of superplasticity in the material at various stages. Superplasticity was typically exhibited by large elongations of around 200% in tension. Variation of elongation to failure with temperature was calculated to confirm that superplasticity is achieved when boron is added to titanium alloys.

FUTURE DEVELOPMENT

Future attempts will be focused towards identifying various production areas where the technology can be utilized. The strain rate and temperature parameters for each specific composition require optimization before the technology can be adapted for commercial applications.

LICENSING OPPORTUNITIES

The patent application for this technology has been filed. Licensing opportunities are available.

For more information contact:
Ohio University
Technology Transfer Office
340 West State Street, Unit 11, Athens, OH 45701
T: 740.593.0462, F: 740.593.0186
tto@ohio.edu

OHIO UNIVERSITY