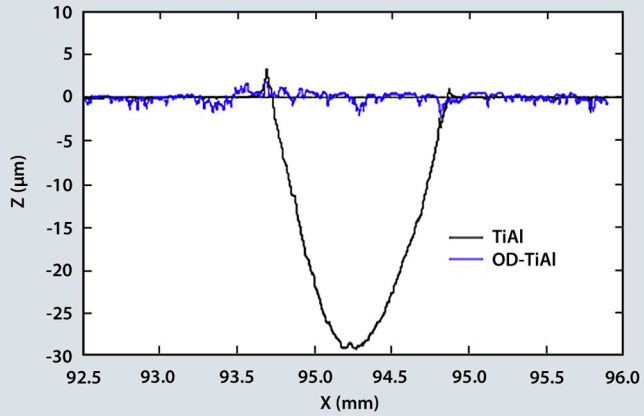
Oxygen Diffusion to Dramatically Improve the Wear Resistance of Titanium Aluminides

UT-B ID####



Comparison of wear scar cross profiles. The untreated TiAl surface shows a maximum wear depth near 30 µm while the OD-treated surface had virtually no wear.

Technology Summary

To dramatically improve the wear resistance characteristics of titanium aluminide (Ti-Al) intermetallic alloys, ORNL researchers invented a surface treatment method using oxygen diffusion. Preliminary study has demonstrated a friction reduction of 20% and a wear reduction of at least three orders of magnitude when dry sliding against a bearing steel.

Ti-Al intermetallic alloys are known for their performance at high temperatures and are used in applications such aircraft and turbines. Yet, despite their mechanical resilience, these alloys generally do not hold up well to high wear situations. The invention offers a means of improving wear resistance and hardness.

The method involves heating a titanium alloy material in an oxygen-containing environment to produce a top oxide layer and underlying oxygen-diffused layer. This technique is expected to significantly broaden the usage of titanium aluminides in bearing applications, such as mechanical components.

Advantages

- Improved hardness
- Improved wear resistance
- No spallation issues
- High bulk ductility

Potential Applications

- High temperature bearings
- High temperature turbines

Patent

Jun Qu, Hua-Tay Lin, Peter J. Blau, and Vinod K. Sikka, *Oxygen Diffusion to Dramatically Improve the Wear Resistance of Titanium Aluminides (TiAl, Ti3Al, TiAl3),* U.S. Patent Application 12/416,323, filed April 1, 2009.

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