OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference on
Nanotek & Expo

December 2-4, 2013 Las Vegas, USA

Experimental investigation and FE modeling of nanoindentation behavior of Ti-6Al-4V alloy for aero engine components

A Kumaraswamy

Defence Institute of Advanced Technology, India

Abstract

Instrumented indentation has become an important non-destructive procedure that can be used to evaluate the mechanical properties of a wide range of engineering materials across the nano, micro and macro length scales. The characteristic properties of biological materials and structures, organic polymers, metals, ceramics and electronic materials can also be evaluated via indentation. The simplicity of the indentation process offers a number of advantages when compared to other experimental approaches for assessing the micro-nano mechanical properties of materials and structures that possess limited volumes. Elastic modulus and hardness are the two properties that are more frequently measured by the load and depth sensing indentation technique. Furthermore, the plastic properties of a material, such as yield stress and work hardening exponent have also been extracted from instrumented indentation.

In the present investigation, nanoindentation was carried out to extract the elastic and plastic properties of Ti-6Al-4V alloy at two heat treatment conditions using Dao's inverse algorithm and the results were compared with the tensile test data. It was observed that, the elastic modulus from nanoindentation for all the test specimens was about 10% higher than the values obtained in tensile testing, which can be attributed to different size and micro structural levels that are probed. FE analysis using ABAQUS was carried out to simulate the indentation behaviour from elastic-plastic properties obtained from the inverse method. The predicted values from FEA had a good agreement with the experimental results. Pile- up and sink-in behaviour of the alloy was also studied.

Biography

Dr.Adepu Kumaraswamy is currently working as an Associate Professor in Mechanical engineering and Controller of Examinations, Defence Institute of Advanced Technology, Pune, Maharashtra, India. He has 14 years of post M.Tech and 5 years of post PhD teaching experience in the area of Solid Mechanics and Finite Element Analysis and other Design and Manufacturing courses. He was a visiting professor to

- Advanced Systems Laboratory (ASL), DRDL, Hyderabad, A.P,India
- Nuclear Fuel Complex, Hyderabad, A.P,India

He did his PhD on '***High strain-rate plastic flow behavior of Ti and Ni base super alloys through dynamic indentation***' from Osmania University, Hyderabad, Andhra Pradesh, India in 2008 and M.Tech (Design & Production Engg-Machine Tools) from National Institute of Technology, Warangal, Andhra Pradesh, India and B.Tech(Mechanical Engineering) from Kakatiya University, Warangal, Andhra Pradesh, India. He has 12 publications in reputed international journals and good number of publications in international conferences and also a reviewer of

- ✓ International journal of Materials Science & Engg-B
- ✓ International journal of Materials & Design.
- ✓ Reviewer of International Journal of the Physical Sciences.

His academic achievements include

- ✓ Listed in **Who's is Who in the World** (29th edition), 2012.
- ✓ Recipient of **Sir Issac Newton Scientific Award of Excellence** for 2012
- ✓ Recipient of **Man of the Year** for 2012 by American Biographical Institute
- ✓ Recipient of Cambridge Certificate for **Outstanding Engineering Achievement** for 2012 by International Biographical Center, Cambridge, England.