Effect of heating rate and heating methodology on the mechanical and microstructural properties of Ti-6Al-4V alloy

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The tensile test is considered as an accepted test for the specification of materials both at ambient and elevated temperatures. Different types of heating techniques are available today in order to attain the desired temperature during elevated temperature tests, but very little effort has been put towards studying the influence of these different heating techniques on the mechanical properties of the materials obtained from these tests. As a result, two classes of experiments were conducted in this study in order to investigate the effect of different heating techniques on the mechanical behaviour of the Ti-6Al-4V (Ti-64) alloy during high temperature tensile tests. In the first class of experiments, the specimens were heated using a Severn Thermal Solution Split high temperature furnace and in the second class of experiments, a state of the art induction heater was used to heat the specimens up to the target temperature. In both cases, the specimens were heated at different heating rates to the prescribed temperatures and then stretched until failure. In addition to the effect of heating rates on the mechanical behaviour, this study also investigated the influence of specimen heating techniques used on the elastic moduli, yield strength, ultimate tensile strength and fracture strength of the Ti-64 alloy. Metallographic analysis was carried out, which investigated the effect of heating technique, strain rate, heating rate and temperature on the microstructure of the alloy. With induction heating offering the possibility to heat up materials to extremely high temperatures, irrespective of size and shape of the test specimen, the results from this investigation are expected to pave the way towards extending the limits of high temperature materials and its testing.

Biography

Mr. Amal Shaji Karapuzha has completed his MSc in Aerospace Structures and Materials from Delft University of Technology in Netherlands. He is currently working as a Research Associate with the Department of Materials Science and Engineering at University of Sheffield, UK.

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