Seminar

Institute for Plasma Research

Title : **Investigation of mechanical properties of Plasma processed aluminized Ti6Al4V alloy**

Speaker : Mr. Tejas Jagdishbhai Parekh
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Date : **24th December, 2019 (Tuesday)**

Time : **11:00 AM**

Venue : **Committee Room 3, (New Building), IPR**

Abstract:

Ti6Al4V is α+β type Titanium alloy which has vast applications in Aerospace, Defence, Petro-chemical, Bio-medical and Automotive sectors due to its excellent strength to weight ratio and corrosion resistance. However, the application of Ti6Al4V is limited to 450 °C due to low oxidation resistance at elevated temperatures. It is reported that the Titanium Aluminide (Ti-Al) coating can improve the oxidation resistance of Ti alloys due to formation of stable α-Al_2O_3 on the surface.

Though Ti-Al coating improve the oxidation resistance of Ti6Al4V, there is a lacuna on the effect of this coating the tensile properties of Ti6Al4V. Furthermore the effect of plasma treatment on the resultant diffusion aluminide coating also needed to be understood. The investigation of the oxidation resistance and tensile behaviour of aluminide coated and uncoated Ti6Al4V at room temperature and at 600°C temperature was attempted. Ti-Al coating was developed on Ti6Al4V by Hot-dipped Aluminizing (HDA) technique and diffusion heat treatment. For a comparative analysis, the diffusion heat treatment was performed with and without oxygen plasma environment. The XRD analysis indicated that the plasma treated TiAl2/TiAl3 phases were of 38 nm crystallite size whereas the thermally treated TiAl2/TiAl3 phases were of 110 nm crystallite size. The cyclic oxidation test was carried out for uncoated samples, thermally treated (THT samples) and plasma treated samples (PAHT samples) at 600°C for 120 hours for a comparative evaluation. Significant improvement in the oxidation resistance was observed for coated samples. Weight gain during oxidation studies in PAHT samples was almost 100 times less than uncoated samples and 8 times less than THT samples. This improvement in oxidation resistance could be attributed to the nanocrystalline structure of Ti-Al diffusion layer formed due to plasma treatment. However, the Ultimate tensile strength (UTS) and Yield strength (YS) of coated samples found less than that of uncoated samples. In room temperature tensile tests, significant reduction in UTS and YS was observed for PAHT and THT samples as compared to bare Ti6Al4V. However, the tensile test conducted at 600 °C showed little effect of aluminide coating on the tensile properties of the substrate.