

# Seminar

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## Institute for Plasma Research

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**Title :** Characteristics of Adhesive Joining of PEEK to Titanium for Aerospace Application

**Speaker:** Dr. Sabbir Ahmed

Amrita Centre for Research and Development,  
Coimbatore

**Date :** 1st March 2019 (Friday)

**Time :** 3.30 PM

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

### **Abstract :**

This investigation highlights on adhesive bonding of titanium (Ti) to titanium, polyether ether ketone (PEEK) to polyether ether ketone (PEEK) and titanium to PEEK. Metal titanium alloy (Ti6Al4V) is modified by sodium hydroxide anodization process and plasma nitriding technique respectively. Plasma nitrided titanium is characterized by X-ray Photoelectron (XPS) study and SEM (EDAX) study. The surface energy of the plasma nitrided titanium alloy is carried out by the measurement of contact angle. The results of above mentioned studies indicate presence of polar functional group into the surface of surface treated titanium.

Similarly, the surface of PEEK is also modified by low-pressure plasma and characterized by XPS and SEM (EDAX) study. Contact angle of surface modified PEEK with respect to untreated PEEK is also studied in this investigation. The low contact angle of surface modified PEEK increases the surface energy of surface modified PEEK in compare to untreated PEEK.

Epoxy-novolac IPN adhesive is used for adhesive bonding of Ti-to-Ti, PEEK-to-PEEK and PEEK to Ti. Epoxy-novolac IPN adhesive is synthesized in laboratory with the help of two polymers such as epoxy and novolac by adopting interpenetrating polymer network (IPN) technique. The existence of FTIR peak of the adhesive gives a clear idea about the formation of poly-blend in between epoxy and novolac. The swelling study of the adhesive give a strong proves of IPN formation. The thermal and mechanical properties of the adhesive are also studied by Thermal gravimetric analysis (TGA) and ultimate tensile strength.

The epoxy-novolac IPN adhesive bonded Ti-Ti, PEEK-PEEK and Ti-PEEK are characterized by lap-shear tensile strength study. The results of the lap-shear tensile strength indicate adhesive bond strength of surface modified PEEK and Ti shows higher joint strength in compared to untreated PEEK and Ti. This is because of the surface modification increases the surface energy of the PEEK and Ti and therefore, the adhesive bond strength is enhanced. The results may be concluded that for high adhesive bond strength it is very important to modified the surface of the materials such as polymers as well as metals.

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