Seminar

Institute for Plasma Research

Title : Surface modification of Aramid fiber by plasma treatment for property enhancement studies

Speaker: Dr. Falguni G Bhabhor
Institute for Plasma Research, Gandhinagar

Date : 10th February 2021 (Wednesday)

Time : 02:00 PM

Venue : Online - Join the talk:
https://meet.ipr.res.in/20210210_FalguniPDFtalk

Abstract :

Aramid fibre composites have found wide range of applications in aerospace, space and defense sector owing to its high strength to weight ratio. Especially Aramid fabrics (e.g. KevlarTM) have been utilized to make Kevlar composites. In general Kevlar is a synthetic crystalline fiber with strong heat, chemical and high tensile strength1 . It is known that the interface between the reinforcement fibres and the resin matrix is the weakest zone and most failures initiate from this region. Surface activation is thus one of the important aspect to enhance the interface strength. In present study the effect of the plasma treatment on the interfacial adhesion of Kevlar-epoxy resin composites was studied. The effect of RF plasma on the surface modification of aramid fibres (200 gsm bidirectional-BD KevlarTM fabric) was studied using video contact angle (VCA) and FTIR measurements. It was observed that plasma treatment generates polar functional sites resulting in improved wettability. Further, the plasma treated BD fabrics were subjected to vacuum infusion technique to prepare composite laminate sheets. The tensile tests so conducted revealed a 23% increase in tensile properties of plasma treated composite as compared to untreated Kevlar composites. Further, the effect of graphene addition as reinforcement was also investigated and compared with plasma processed samples. It was observed that graphene based Kevlar composites of 0.75w% graphene resulted in the best result and were comparable to plasma treated (without graphene) laminates. Further scope of investigation in this area will be discussed in detail.

Reference

1. Gore P.M (2018)., Kandasubramanian B. Functionalized Aramid Fibers and Composites for Protective Applications. A Review. Ind. Eng. Chem doi: 10.1021/acs.iecr.8b04903
2. G.S. Sheu & S.S. Shyu (1994) Surface modification of Kevlar 149 fibers by gas plasma treatment. Part II. Improved interfacial adhesion to epoxy resin, Journal of Adhesion Science and Technology, 8:9, 1027-1042, DOI: 10.1163/156856194X00906