International Conference on
PLASTIC ENGINEERING & POLYMER SCIENCE
June 25-26, 2019 | Tokyo, Japan

Padmanabhan Krishnan
VIT University, India

Self-reinforced polymer composites - A global solution to technological challenges

Self-reinforced polymer composites (SRPC) which have the same material in different structures as the matrix and the reinforcement possess comparable shear and tensile strengths unlike the glass, boron or carbon fibre reinforced polymer composites. Due to their ultra-light weight specific properties (the olefins like polyethylene and polypropylene are lighter than water), they are increasingly used in marine, transportation, electronics and aerospace luggage applications. In this key note lecture, Low and High density Polyethylene, Ultra High Molecular Weight Polyethylene, Polypropylene, Polyamide and other self-reinforced polymer composites are evaluated for the purpose of correlating their interfacial properties with the static and dynamic mechanical properties. As the same material is bonded to itself in as many structurally different forms as possible, a skilled tailoring of the micro-interface between the matrix and the reinforcement and its evaluation play a major role in deciding the macro-structural properties of the composite. Interfacial characterization using specially designed pull out tests and spectroscopy, static mechanical tests using computer controlled Universal Testing Machines, drop mass impact tests and post failure microscopic analysis reveal the relationship between interfacial properties and the static and dynamic mechanical properties of these ultra-light composite materials. Some of the benchmarked SRPC designs that find high-end applications in ballistic helmets and vests are discussed. Interesting case studies will be quantitatively highlighted. Current methods of improving the properties of matrix and reinforcement material, their processing and modification of the interface for superior performance will be discussed. Some of the SRPCs float on water when processed in any shape that provides for novel applications in air cargo systems and marine structures where floatability and light-weighting are important in energy and cost savings with safety included. As most of the SRPCs are thermoplastics, their recyclability, disposability and degradability issues are taken into consideration. Carbon/ carbon composites processed through the cost effective polymer route that find wide applications in tribology and ablation are discussed. Bio friendly and bio-derived SRPCs which answer some of the environmental concerns are increasingly being designed and developed for similar applications not as lesser substitutes but as design and durability specific alternatives. The keynote lecture concludes with projections on consumption, demand and foreseen issues and challenges. Existing solutions and a vision for a consensual future for SRPCs are charted out.

Biography

Padmanabhan Krishnan is currently working on the dynamics of composite materials. He has received his PhD from IISc, Bangalore, and has rich post-doctoral experience from the USA and Singapore. He has more than 260 publications international journals. He administers & guides research. He is a life fellow of four organizations and a recipient of many national and international awards.

padmanabhan.k@vit.ac.in