



The issue on “Advances in Composite Materials for Structural Applications” has a very special flavour being edited for the first time by a non Indian Institute of Science faculty. On behalf of all the editorial members, I wish to place on record our deepest sense of gratitude and appreciation to Dr. Makarand Joshi from DRDO, Pune. All the articles have been carefully chosen and edited with an emphasis on the utilization of composite materials in various applications. Functional materials now occupy a key area in our daily life and in fact dependability and durability thus are of enormous significance in such products. Production and understanding at a structural level of composites is a major challenge and the reviews explore these aspects in great detail. One of the virtues of a composite material is its multifunctional characteristic and the articles provide an in depth evaluation on structure-function correlation. The importance of biocompatibility is addressed in one of the articles which arise as demands from environment friendly requirements. Nano- materials have gained the forefront in recent times as they have a prolific capacity to demonstrate multifunctional-behaviour. Once again, a special thanks to Dr. Joshi and all the authors who have contributed to this issue. The dedicated effort of the editorial staff is acknowledged and as always they have brought out the issue well in time.

We can eagerly look forward to the next issue (Oct–Dec 2015) which is on “Design Science; Theories, Methods and Tools” guest edited by Professor Amaresh Chakrabarti who hails from the Centre for Product Design and Development of the Indian Institute of Science.

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Advances in Composite Materials for Structural Applications

That the composite materials have a distinct advantage over their metallic counterparts in terms of specific weight and strength, corrosion resistance, tailorability, etc., is now a clichéd statement. Composites have proven their worth in gold when one looks at today's aircraft structures, naval structures, sporting goods, applications related to infrastructure etc. We can safely conclude that composites are now a part of our daily life and their usage is bound to increase in more mundane applications in the coming years making several parameters such as cost, manufacturability, lifecycle monitoring, etc. important aspects for study.

Use of composites for niche applications that impose requirement of multi-functional behavior from the structure, such as stealth, radar transparency, ballistic impact and blast protection etc. is also on the rise. With the advent of nano materials, nano fillers in composites are now seen as the most promising materials for imparting multi-functionality to composite structures.

Cost of a composites product depends not only on its ingredients but largely on the manufacturing process chosen. Out-of autoclave manufacturing of primary structural components of high-end products has gained importance of late, due to the promise shown by processes such as VARTM and RFI. Cost effective manufacture of composites will be an important factor that will eventually determine the extent of their widespread proliferation.

Composites are inherently energy absorbing materials due to their layered configuration. However, their performance under cyclic loading, or their fatigue life, unlike metals, is difficult to determine. With proliferation of composites, study of this aspect has gained prominence as it is directly related to reliability and safety of the products.

Since composites are a layered material, possibility of embedding sensors/actuators inside the structure exists. This enables us to gain information regarding response of the structure to external disturbances throughout its volume which is not possible in any other material. Thus health monitoring in the true sense is possible in case of composites.

Despite all these advantages, composites as materials are not "green". They are difficult to recycle and are not at all bio-degradable. Of late, there has been a great thrust on realizing composites from bio-degradable constituents. The challenge is to match performance of the "green" composites with that of the conventional composites.

This issue covers review of advances in structural composites related to their cost-effective manufacturing, their fatigue performance, health monitoring and use for multi-functional applications. Composites truly give the designers immense freedom to implement their leaps of imagination into real products. The day is not far when we will start living in the world of highly reliable smart structures with cognitive and reactive capabilities and composites would be the enabling technology that would have made this possible.



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