



# 学术报告



## 报告题目: Nanocomposites at Space Environment



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### 报告内容简介:

Polymer-based advanced composites always suffer from degradation at extreme temperatures in the range between 220 and 77 K and low atmospheric pressure. Within this temperature range, composite structures behave very brittle and many micro-cracks are easily formed due to differential thermal coefficients of expansion (CTEs) between polymer matrix and high strength reinforcements. Besides, at the Low Earth Orbit (LEO) environment the structures may also be subject to damages due to micro-meteoroid attack, in which many tiny particles left over from the formation of the solar system and they are travelling at very high speed (hyper-velocity) to cause serious impact and abrasion onto the structures. Out-gassing and high oxidation rate are also problems for polymers using at this environment. In this lecture, an overview on the nanocomposites, their mechanical, thermal and structural properties at different working environments is given. The following key items will also be introduced: (i) design of the heat shield's geometry for re-entry vehicles; (ii) shock wave effect in relation to the heat transmission to the vehicles; (iii) advantage of using Phenolic Resin Carbon Ablator (PICA); (iv) types of nanoparticles for property enhancement for the vehicles and (v) possibility of using nano-particles to enhance the effectiveness of pyrolyzing process of PICA to prolong the heat transfer.

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