

CHARACTERIZATION OF COMPOSITE MATERIALS

Lucideon is a materials technology consultancy that focuses on innovation, sustainability and quality assurance of materials.

We help clients in the composites and related industries to overcome materials challenges and develop new products, processes and technologies, thereby creating competitive advantage and enhancing profitability.

INTRODUCTION

Lucideon has the capability to characterize materials in three dimensions for chemical composition, morphological microstructure and topographical profile. These skills have been applied to the analysis of composite materials in the following areas:

COATING ADHESION

Interfacial adhesion is critically dependent on surface roughness for keying. This can be measured and statistically quantified for specification and control purposes by 3D profilometry with nanometer precision.

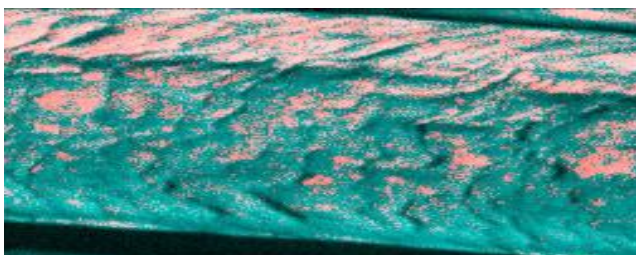


Fig. 1. Surfactant residues (pink) on fiber (green)

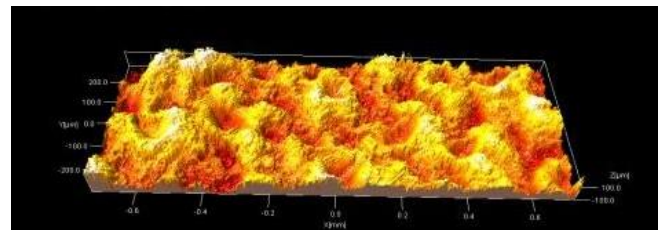


Fig. 2. 3D topographic profile with quantified axis

CONTAMINATION

Contaminants are a common cause of failure in engineered systems. Surface analysis can chemically identify contaminants, quantify them at ppb levels, and spatially resolve their distribution by chemical species mapping.

FIBER OXIDATION

Carbon is susceptible to various forms of degradation including hydrolytic oxidation. Chemical mapping can be used to show where degradation has occurred and to what extent.

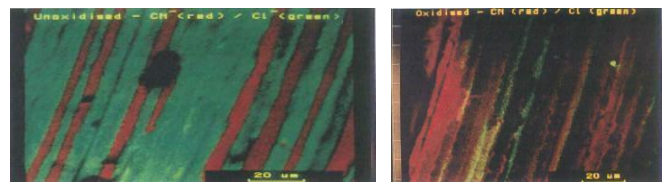


Fig. 3. Chemical mapping of un-oxidized (left) and oxidized fibers (right)

FIBER-RESIN DISBONDMENT

The use of fiber size can be reverse engineered by surface analysis - see 'contamination' above, and voids in structures can be picked up by electron microscopy.

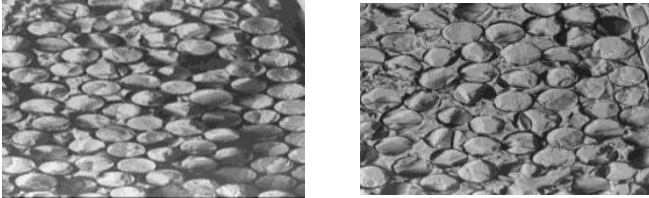


Fig. 4. Voids (left) vs well impregnated composite (right)

COATING DIAGNOSIS

Composite parts are often painted and these can be multilayer systems. Cross-sectional chemical mapping can be used to distinguish the layers and any inter-layer encroachment.

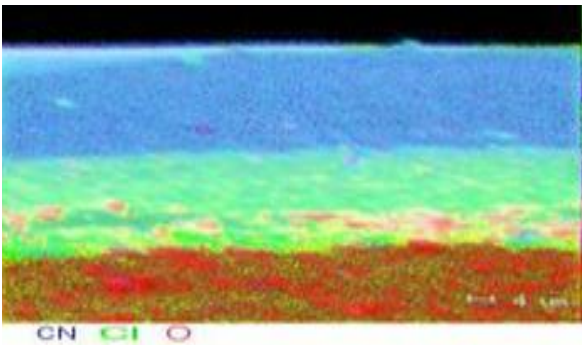


Fig. 5. Chemical profiling of a multi-layer coating cross-section with inter layer ingress