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## Microstructural Effects on the Corrosion Behaviour of Carbon/Aluminium Composite Materials

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The environmental degradation of aluminium alloys reinforced with carbon fibres in sea media is a major concern in the aeronautic industry for the use of these composite materials on planes. The galvanic corrosion occurring at the fibre/matrix interfaces (Ref 1) weakens the load transfer from the metal to the ceramic reinforcement and leads to a loss of the mechanical properties of the material. A new measurement method (Ref 2) is used to provide quantitative and local informations on the galvanic corrosion. A combination of different techniques of *in situ* microscopy affords to evaluate the morphology and the growth kinetics of corrosion cavities at the carbon/aluminium interfaces.

The galvanic corrosion mechanism is governed by electrochemical processes but may also come from chemical and physical interactions between the constituents. The material microstructure plays thus a primary role in the corrosion kinetics.

A chemical reaction can occur during the processing between carbon and aluminium, that form an aluminium carbide. The corrosion initiation mechanism at the fibre/matrix interface was studied with *in situ* Atomic Force Microscope (ISAFM) to determine the relationship between these carbides and the degradation kinetic.

The volume fraction of fibre and the architecture of the preform as well as alloying elements affect the propagation of the galvanic corrosion in the composite material. An *in situ* Video Microscope (ISVM) was used to study the influence of these microstructural parameters on the corrosion kinetic. The fibre section exposed to the environment was shown to have a major effect on the corrosion mechanism (Fig.1, 2), depending on the texture of the carbon fibre.

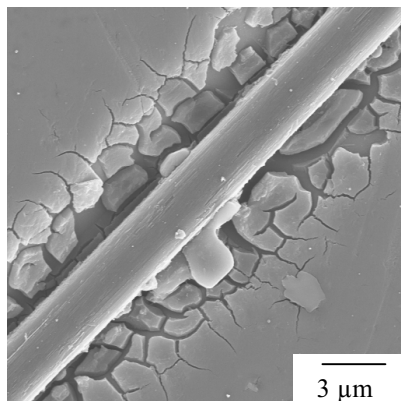


Fig.1 Corrosion cavity at an interface between aluminium and a carbon fibre in axial section

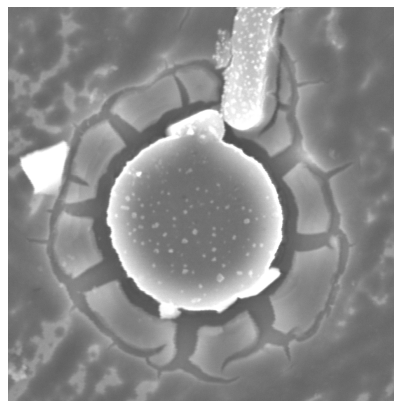


Fig.2 Corrosion cavity at an interface between aluminium and a carbon fibre in transverse section

### References

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