

Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en Sciences de l'Ingénieur

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Ingénieur civil en chimie et science des matériaux

Characterization and modelling of the microstructure and fracture of thermoset/thermoplastic interphases

Thermoset composite assembling by welding of thermoplastic surface layers has received growing interest in recent years due to the necessity for the aeronautical field to improve its joining methods used for assembling composite parts. One of the key aspects of this method is the damage resistance of the thermoset/thermoplastic interphases involved in the joints and formed during the co-curing of the composites in presence of the thermoplastic layer at their surface. More specifically, an in-depth understanding of the link between the processing and the damage mechanisms through the microstructure of the interphases would definitely lead to the improvement of the quality of the welds.

In this thesis, the physico-chemistry and the mechanics of the interphases formed between a high Tg thermoplastic and a high density thermosetting network are investigated. First, the determination of the concentration profiles as well as the observation of the morphological gradients as a function of the curing cycle establish the experimental link between the process of the interphases and the resulting microstructure. This experimental work is then complemented by the development of a phase field model dedicated to the prediction of the formation of the observed morphologies. Finally, the mechanical characterization of the interphases, both in terms of elastoplasticity and fracture resistance, builds the connection between the microstructure and the damage mechanisms of the interphases.

It turns out that by controlling the interaction between the interdiffusion and the curing kinetics through an appropriate choice of curing cycle, it is possible to generate interphases which trap the cracks propagating during the fracture process. This crack trapping effect is due to combination between the softening evidenced upon mixing the thermoplastic with the thermoset and the high fracture toughness values of the microstructures observed in the morphological gradient.

Lundi 21 novembre 2016 à 14h00

Auditoire SUD 19
Croix du Sud
1348 Louvain-la-Neuve



Membres du jury :

Prof. Christian Bailly (UCL), promoteur
 Prof. Thomas Pardoën (UCL), promoteur
 Prof. Jacques Devaux (UCL), président
 Prof. Evelyne van Ruymbeke (UCL), secrétaire
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