

Invitation à la soutenance publique de thèse

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

Monsieur Amir BAHRAMI **Master ingénieur civil en chimie et science des matériaux**

Contributions of atomic force microscopy to the mechanical property mapping of polymer blends and nanocomposites

In 30 years since the invention of Atomic Force Microscopy (AFM) this technique has considerably evolved and turned to a versatile characterization tool capable of simultaneous microstructure and property mapping. Further development of modern engineering materials with ultrafine phases and interfaces requires local characterization techniques with enhanced spatial resolution and material sensitivity as well as reliable property quantification. AFM-based dynamic force spectroscopy has great potentials for the local mechanical mapping of polymer blends and nanocomposites at a length scale, which is not accessible to most of other techniques.

In this thesis the local-global relationship in the mechanical properties of toughened epoxy-matrix composites as well as the local heterogeneity of mechanical response in cured epoxy resins were investigated using the HarmoniX and the Peak-Force-QNM modes of AFM. High resolution mapping of the microstructure and mechanical properties like the elastic modulus and the adhesion force helped to unravel the complex microstructure forming phenomena in the former and the local property heterogeneities in the latter.

Furthermore, the performance of AFM for local mechanical characterization was evaluated in terms of spatial and property resolution and quantification aspects. It was demonstrated that the resolution is essentially influenced by the size of the contact between the AFM tip and the sample surface, while the mechanical properties of the AFM probe itself could also improve these parameters. Finally, it was shown that the quantitative modulus mapping using the HarmoniX mode is more reliable due to more effective way of acquiring the force versus distance curves.

Mardi 16 janvier 2018 à 14h30

Salle de Séminaire ISV
Bâtiment Carnoy
Place Croix du Sud, 4-5
1348 Louvain-la-Neuve



Membres du jury :

Prof. Christian Bailly (UCL), Promoteur
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Prof. Jacques Devaux (UCL), Président
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Dr. Philippe Leclère (Institut de Recherche en Science et Ingénierie des matériaux, UMONS)
Dr. Michel Ramonda (Centre de technologie en micro - et nanoélectronique, Université de Montpellier, France)