2 Ph.D. positions in Computational Mechanics in Luxembourg

The computational mechanics group of Prof. Stéphane Bordas (www.legato-team.eu , www.uni.lu) is searching for two Ph.D. students to work on one of the following projects. Both projects focus on phase-field damage modeling, rubbery polymers, and experimental validation. All work is carried out in close cooperation with the industrial partner SISTO Armaturen S.A. (www.sisto-aseptic.com , www.ksb.com).

Project 1

The project aims to analyze the formation and growth of micro-cracks in rubber due to fatigue loading. Recently published articles on fatigue failure of rubber show that micro-cracks nucleate at initially present natural flaws. The initial distribution of flaws and the micro-crack growth is investigated with CT-scans and interrupted fatigue tests. These results are used to refine a fatigue phase-field damage model for this scale. Key points are:

- Measure the initial flaw size with CT-scans for various process parameter and compounds
- Interrupted fatigue tests with CT-scans to study the micro-crack growth
- Fatigue tests with samples with artificially introduced flaws
- Refine a fatigue phase-field damage model for micro-scale simulations
- Implementation of a fatigue phase-field fatigue model
- Parameter calibration and validation of the numerical model with experimental data

Project 2

This project focuses on the thermal aging of rubber. An Arrhenius law is often applied to the test data to predict behavior at lower temperatures. However, this implies that the degradation mechanism at the highest temperature is the same as at the lower temperatures. A new thermo-chemical model should be developed to study the degradation of material properties over the entire temperature range. This model is combined with a recently published fatigue phase-field damage model to study the influence of aging on the failure of rubber parts. Key points are:

- Experimental study of thermal aging taking into account the influence of temperature, media, and sample thickness.
- Development of a numerical model to predict the influence of aging on the material properties of rubber
- Couple the new model to a fatigue phase-field damage model
- Parameter calibration and validation of the numerical model with experimental data

Offer

Four years of funding for the Ph.D. student is provided with a competitive salary. Funds to attend conferences and summer schools are available. Each student will be employed by the university, but she/he will also spend a significant amount of time in the company.

Candidate profile

Aspiring researchers interested in a Ph.D. topic with strong industrial relevance are encouraged to apply. Only those who hold an MSc degree or will hold one in the near future will be considered. We are specifically looking for those who hold an MSc degree in Engineering. A background in and affinity with some of the following fields is required:

- Material/constitutive modeling and structural mechanics,
- Finite element analysis
- Experimental work
- Scientific computing (numerical integration, optimization, etc.)
- Some form of programming (MATLAB, Python, C++, FORTRAN, etc.),

Application

Send one combined email with your application letter and CV to **all** of the following email addresses:

stephane.bordas@gmail.com (Prof. Stéphane Bordas)

pascal.loew@ksb.com (Dr. Pascal J. Loew)