



***Damage mechanisms in insulating polymer materials under electric field :
theory and simulations.***

PhD starting fall in 2019

at the CNRS/Solvay Joint Laboratory (Lyon, France)

The aim of the PhD is to describe damaging mechanisms under applied electrical fields which lead eventually to electrical breakdown of the material. This is a theoretical work which follows earlier experimental and theoretical studies on damaging under mechanical stress [1,2] and an on-going experimental PhD regarding damaging under applied electric field. Currently, we study the microscopic mechanisms under medium to high electric field, in long lifetime regime. The dielectric properties of materials are investigated along electrical fatigue tests on different polymer samples combined with various characterizations methods. Based on these works, we have identified various damaging mechanisms on the microscopic scale. A theoretical model will be developed and implemented into a 3D numerical model. The results of the simulations will be compared to experimental results.

This PhD is part of a collaboration between Nexans, a worldwide leading company for electric networking, Solvay and Laboratoire Polymères et Matériaux Avancés (LPMA), within the context of the “Lyons Polymer Science and Engineering” collaborative network. The PhD will take place at LPMA.

[1] E. Mourglia-Seignobos, D.R. Long, L. Odoni, L. Vanel, P. Sotta, C. Rochas, "Physical Mechanisms of Fatigue in Neat Polyamide 6,6", *Macromolecules*, 47, 3880-3894 (2014)

[2] C. Fusco, D.R. Long, L. Vanel, Brittle-to-ductile transition in creep rupture of 2D disordered elastic materials, to appear, *Journal of Statistical Physics* (2019)

The Solvay/CNRS Joint Laboratory (UMR: Unité Mixte de Recherche) ‘Advanced Materials Laboratory’, is located near Lyon, France. The objective of the lab is to develop fundamental research on physical properties of heterogeneous polymer materials, in order to be able to propose innovative materials with tailored properties and improved usage properties for new applications.

This PhD project is suitable for applicants graduated in polymer physics and/or condensed matter physics and/or statistical physics and/or mechanics and material science with a strong theoretical and numerical background.

Please send application (detailed CV, application letter) to the following contact persons

Didier LONG

Email : didier.long-exterieur@solvay.com

Tel : +33 428 27 10 30

Paul SOTTA

Email : paul.sotta-exterieur@solvay.com

Tel : +33 (0)4 28 27 10 29