

CHARACTERIZATION AND MODELING OF THE THERMAL AGING IN A FILLED RUBBER

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ABSTRACT - As other organic materials, many rubbers exhibit an evolution of their internal micro-structure due to environmental factors (including mechanical and thermal loadings). This evolution in time obviously impacts their physical characteristics and need to be taken into account by engineers to design industrial parts, that are related to safety for instance. From a scientific point of view, this question is very challenging from both, the experimental and the modeling point of view. In general, we only see the consequence of these micro-structural evolutions and the identification of their origin is complex.

Here, we restrict our study to the case of thermal aging of a synthetic rubber filled with carbon blacks and vulcanized with sulfur. We investigate the relation between the type of crosslinks and the chemical evolution that occurs during thermal aging. The influence of the mechanical loading during aging and the consequence after aging is also studied.

Based on previous works on the modeling of thermo-chemo-mechanical couplings (N'Guyen et al [2016]; Lejeunes et al [2017]), we propose a phenomenological model that describes the evolution of the behavior in time. This model is implemented either in a Finite Elements or in Isogeometric Analysis.

REFERENCES

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