Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Statistical properties of microcracking in polyurethane foams under tensile and creep tests: influence of temperature and density. STEPHANIE DESCHANEL, GERARD VIGIER, NATHALIE GODIN, GEMPPM, INSA Lyon, France, LOIC VANEL, SERGIO CILIBERTO, Laboratoire de Physique, ENS Lyon, France — For some heterogeneous materials fracture can be described as a clustering of microcracks: global rupture being not controlled by a single event. We focus on polyurethane foams whose heterogeneities (pores) constitute the termination points where microcracks can stop. We record both the spatial and time distributions of acoustic emission emitted by a sample during mechanical tests: each microcrack nucleation corresponds to a burst of energy that can be localized on the widest face of the specimen. The probability distributions of the energy released is power-law distributed, independently of the material density, the loading mode or the mechanical behavior. On the other hand, the agreement of a power law for the time intervals between two damaging events seems to require a quasi constant stress during damaging. Moreover, we notice a behavior difference of the cumulative number of events and the cumulative energy of the localized events with temperature in the case of tensile tests and not any more for creep tests. The occurrence of a unique behavior and a power law in a restricted time interval for the cumulative number of events and the cumulative energy in creep allow us to apprehend interesting later studies of materials' lifetime prediction.

Stephanie Deschanel
GEMPPM, INSA Lyon, France

Date submitted: 22 Nov 2006 Electronic form version 1.4