EML WEBINAR

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7 AM CALIFORNIA, 10 AM BOSTON
3 PM LONDON, 10 PM BEIJING

COSTANTINO CRETON

TESPCI PARIS-PSL

USING LIGHT EMISSION TO REPORT DAMAGE IN SOFT MATERIALS. CAN WE BE QUANTITATIVE?

Recent advances in chemistry have made it possible to directly optically visualize forces on chemical bonds or even bond scission by using molecules that either emit light or become fluorescent upon when activated by the application of a force. Such chemical/optical, tools although experimentally challenging, can be best used in experimental mechanics to investigate the nonlinear properties and failure of soft networks of flexible chains such as elastomers or gels where forces on molecules are directly related to macroscopic stresses. In this seminar after a brief introduction on the type of molecules and signal that can be obtained, we will focus on quantification of the optical signal and how this can be connected with the macroscopic stress field or the damage to the material. The upscaling from the molecular scale to the macroscopic scale presents several challenges and experiments provide novel insight in both physics of polymers and the mechanics of fracture. We will discuss as an example the effect of temperature and rate on the fracture energy of elastomer and demonstrate that molecular bond breakage is far from limited to the interfacial plane and is highly sensitive to fracture conditions.

Professor Costantino Creton currently holds a CNRS position (Directeur de Recherche Except. Class) at the ESPCI Paris-PSL where he arrived in 1994. His research group is in the Laboratory of Soft Matter Science and Engineering and his research interests focus on the mechanical properties at large deformations of soft polymers, spanning from the molecular scale to the continuum scale. He is one of the best known world experts in adhesion and fracture of soft polymer materials such as hydrogels and elastomers and has pioneered several experimental techniques and analysis methods for these inherently multi-scale problems. Recently he has focused on the use of mechanochemistry for the investigation of fracture. He has published more than 200 articles in peer-reviewed journals, nine book chapters and has given more than 110 invited and plenary lectures at international conferences. He has received several prizes and awards including the Adhesion Society's prize for Excellence in Adhesion Science in 2013. He was also elected in 2013 fellow of the American Physical Society and received an ERC Advanced Grant in 2016 to work on fracture of soft materials.

Discussion leader: Professor Tian Tang, University of Alberta

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