**Selected examples of contribution of vibrational spectroscopy to the investigation of rubber blends and composites**

Prof. Dr. Philippe DANIEL

Institut des Molécules et des Matériaux du Mans – IMMM – UMR CNRS 6283 – Université du Maine – Avenue Olivier Messiaen – 72085 Le Mans (France)

Email : philippe.daniel@univ-lemans.fr

This presentation will be mainly devoted to the application of vibrational spectroscopy, either Infra-red spectroscopy (IR), either Raman scattering, to the study of rubber blends and composites and it will be shown what the recent contributions in this field are. Both these techniques are now of major importance in polymer research because they are non-destructive and non-invasive and with a fingerprint character. The recent technological improvements of IR and Raman spectroscopies will be exhibited, for instance the new imaging techniques, and examples will be given in the field of rubber chemistry. Among the selected examples, we will show thermoplastic vulcanizates based on hydrogenated natural rubber/polypropylene blends and the preparation and properties of functionalized natural rubber and NR/SBR blends filled with silica according to different processes or reinforced by biomaterials; Example of oil palm trunk fiber could be given. It will be shown also how the functionalization of natural rubber matrix could be very useful for potential application in other area like food safety. The results obtained for silver nanoparticles/natural rubber composite will be presented with potential applications in antimicrobial systems.

All these works and results are done in collaboration with Thaï research departments located in Mahidol University, Prince of Songkla University, Songkla Rajahbat University and Ubon Ratchatani University.

References:

1. T. Peng-Ubol.; P. Phinyocheep; P. Daniel; W. Panbangred; J.F. Pilard; G. Thouand; M.J. Durand-Thouand; *Plasma-treated polyethylene film: a smart material applied for Salmonella Typhimurium detection,* Materials Science and Engineering C, 32(8) 2641-2648 (2012)
2. S. Prasertsri, F. Lagarde, N. Rattanasom, C. Sirisinha, P. Daniel, *Raman spectroscopy and thermal analysis of gum silica-filled NR/SBR blends prepared from latex system,* Polymer Testing 32(5) 852 – 861 (2013)
3. T. Peng-Ubol, P. Phinyocheep, F. Lagarde-Abribat, P. Daniel, JF Pilard, W. Panbangred, G. Thouand, M.J. Durand-Thouand, *Functionalized polyurethane applied for foodborne pathogen detection,* Journal of Food Measurement and Characterization DOI 10.1007/s11694-015-9230-y (2015)
4. **K. Taksapattanakul, T. Tulyapitak, P. Phinyocheep,** P. Ruamcharoen, [J. Ruamcharoen](http://www.mis.sat.psu.ac.th/staff_directory/publication.php?AW_NO_ID=24260), F. Lagarde, M. Edely, P. Daniel, *Raman investigation of thermoplastic vulcanizates based on hydrogenated natural rubber/polypropylene blends,* Accepted for publication in Polymer Testing (september 2016)

**Keywords:** Natural Rubber/composites, Infra-red spectroscopy, Raman spectroscopy, Polymer blends, surface functionalization