

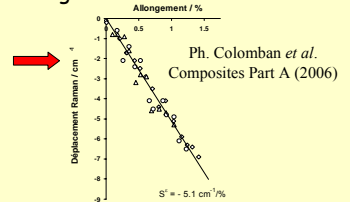
"Nanophases et Dynamique vibrationnelle des solides" Sonder le solide à l'échelle (sub-)nanométrique



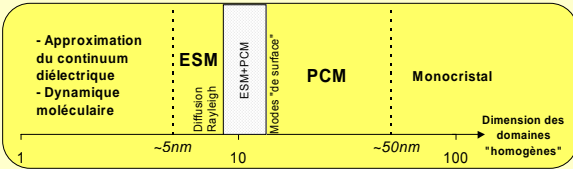
- G. Gouadec, H.M. Dinh, Ph. Colomban, D. Baron, M. Havel (+ Stagiaires)
- ENSMP : V. Jauzein, A. Bunsell, A. Marcellan et JM Herrera Ramirez.

$$I_{\text{Raman}}(\bar{\nu}) = \frac{I_0}{(\bar{\nu} - \bar{\nu}_{\text{vib}})^2 + \left(\frac{\Gamma_0}{2}\right)^2}$$

- sonde structurale (chaque phase présente un jeu de vibrations propre)
- sonde sub-nanométrique (vibrations des liaisons) à résolution micrométrique
⇒ Il est possible d'étudier la matière amorphe / nanocristalline / hétérogène
- sonde mécanique car : $\bar{\nu}_0 = \frac{1}{2\pi c} \sqrt{\frac{\partial^2 V_{\text{liaison}} / \partial l^2}{\mu_{\text{liaison}}}}$
- sonde électronique car : $I_0 \propto \frac{n^B(\bar{\nu})+1}{\bar{\nu}} \sigma(\bar{\nu})$ (+SERS, Résonance)

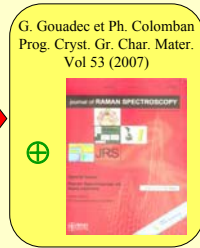
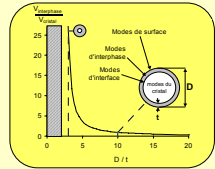


• Comment Interpréter les spectres ?

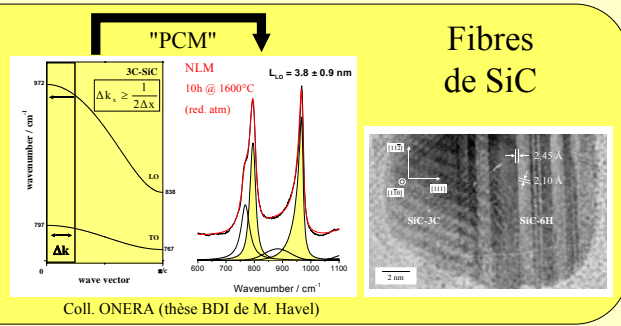
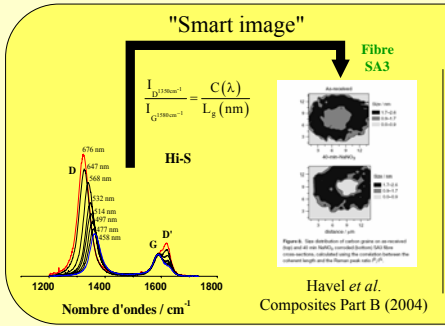
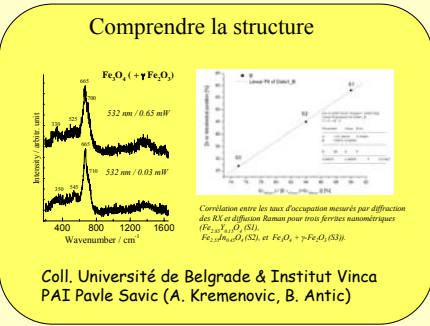


$$I(\bar{\nu}) \propto \int_{q=0}^{q=1} dq e^{\frac{k_{z\text{Be}}^2(q-d_0)^2 L^2}{2\sigma}} \times \frac{1}{[\bar{\nu} - \bar{\nu}(q)]^2 + \left(\frac{\Gamma_0}{2}\right)^2}$$

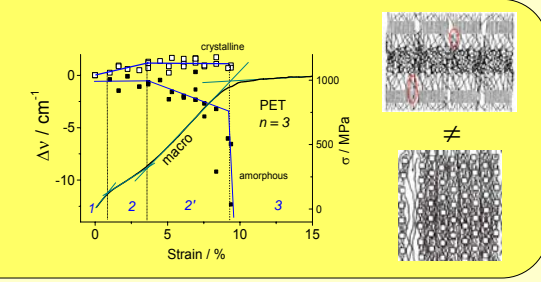
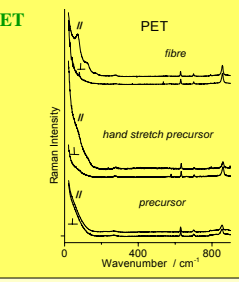
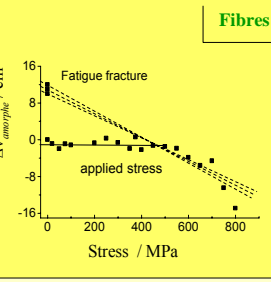
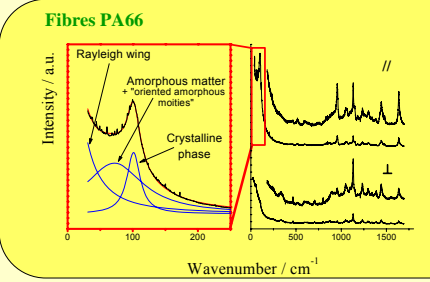
Modèle de Confinement de Phonons
Richter et al., Solid State Comm. 39 (1981)



• Etude de Céramiques

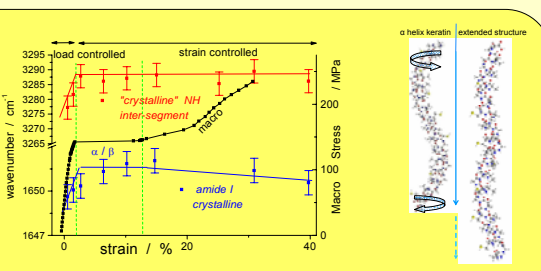
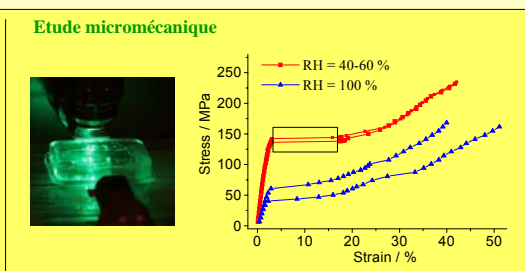
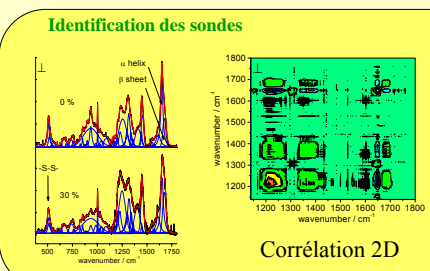


• Etude de Polymères Synthétiques (PA66, PET, PBO, PP)



Ph. Colomban, J.M. Herrera Ramirez, R. Paquin, A. Marcellan et A. Bunsell / Engineering Fracture Mechanics 73 (2006)

• Etude de Biopolymères (cheveux)



R. Paquin et Ph. Colomban / J. Raman Spectr. (2007)