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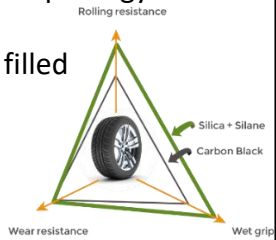
Multi-frequency response of multi-phasic elastomer systems

Equipes PVMH

Context

Multi-phasic elastomer systems

- Two or more than two phases morphology
- Examples:
 - Generally C-black, silica filled
 - **Polymer resin filled**



Major application:

- Automobile **tires**

Characteristic frequencies in tire application

- $10 - 10^2$ Hz: Min. energy dissipation
Lower rolling resistance
- $10^4 - 10^7$ Hz: Max. energy dissipation
Better skid resistance

Why polymer resin?

- Interesting similarity of incompatible resins with filled elastomers (evolution of modulus with frequency/temperature)

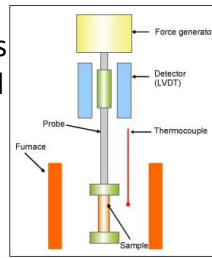
Aim

- To find out Links between compatibility, phase separation, interphase and resulting microstructure and macroscopic mechanical behavior
- Prediction of Frequency/temperature response

Method and tools

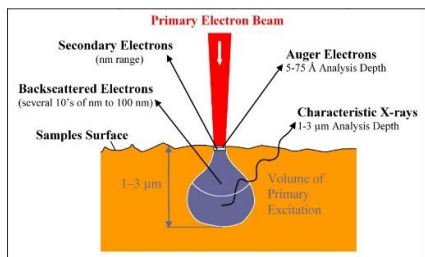
Mechanical behavior

- Dynamic mechanical analysis (DMA) for viscoelasticity and frequency response using models



Microstructure and morphology

- Scanning electron microscopy (SEM)
- Transmission electron microscopy (TEM)
- Atomic force microscopy (AFM)
- Small angle X-ray scattering (SAXS)



Thermal behavior

- Differential scanning calorimetry (DSC)

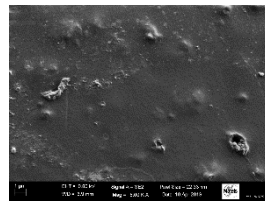
Results

Dynamic mechanical analysis

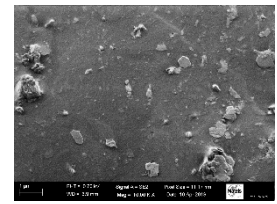
- Analysis of compatibility
- Fitting the experimental results with the models to predict the frequency/temperature response

Scanning electron microscopy

- Analysis of phase separation and interphase generation
- Size of dispersed phase and/or interphase



a



b

SEM images of an elastomer: a. without resin b. with resin