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Effect of Filler Morphology and Distribution State on the Non-linear Mechanical Behaviour of Nanofilled Elastomers DIDIER LONG, CNRS/Solvay, MATHIEU TAUBAN, PAUL SOTTA, JEAN-YVES DELANNOY, CNRS / Solvay — We study the response of elastomers filled with aggregates of different shapes, for deformations of various amplitudes. We show that the distribution state of the fillers controls the reinforcement at high temperature. Energy dissipation is not a monotonous function of the distribution state, exhibiting a maximum for intermediary distribution state. We show how the dynamics of yield of glassy bridges account for this non-monotonous dissipative behaviour. We also study the mechanical response of systems filled with well distributed aggregates of different morphologies. While the filler overall size is kept constant, we increase the number of constitutive primary particles to study aggregates made of one particle (spheres) up to 40 particles (fractal aggregate). Even if the distribution state is fixed, we show a strong effect of filler morphology on reinforcement. We show that distances between fillers are smaller with fractal aggregates leading to stronger reinforcement and non-linear effects. Our model opens the path for the development of systems with tailored properties by tuning the filler distribution state and morphology.

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