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Nature of Strain-Induced Nonlinearity in Filled Rubbers XIAORONG WANG, Bridgestone Americas, Center for Research &Technology, Akron, OH 44317, CHRISTOPHER G. ROBERTSON — We present evidence suggesting the existence of an analogy between dynamic strain-induced nonlinearity in modulus of filled rubbers and physics of the glass transition of glass-forming materials and the jamming transition of vibrated granular materials. This analogy stems from the fact that shear strain in dynamic measurements introduce fluctuations in fillers that can be described by an "effective temperature." The nonlinearity in modulus of filled rubbers simply reflects a de-jamming transition of fillers in rubber matrices. Filled rubbers with respect to strain therefore display many unusual phenomena, including the asymmetric kinetics, crossover effects, and the glass-like transitions. In addition, the jamming transition in filled rubbers also behaves as an isoenergetic thermodynamic transition. This evidence suggests that although jamming is kinetic, it may also be thermodynamic in nature. The coexistence of kinetic and thermodynamic descriptors of the jamming transition is analogous to observations of thermoreversible gels. Based on those results, we propose a unified phase diagram for jamming transitions. The significance of the new jamming phase diagram is that it has incorporated variables that are all derivable from Hamiltonians and may facilitate crucial comparisons between theories and experiments. [1]. C. G. Robertson and Xr. Wang, Phys. Rev. Lett. 95, 075703, 2005. [2]. Xr. Wang and C. G. Robertson, Phys. Rev. E 72, 031406, 2005.

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