From vulcanization to isotropic and nematic rubber elasticity XI-ANGJUN XING, SWAGATAM MUKHOPADHYAY, PAUL GOLDBART, University of Illinois at Urbana-Champaign, ANNETTE ZIPPELIUS, Universitaet Goettingen, Germany — A Landau theory is constructed for the vulcanization transition in cross-linked polymer systems with spontaneous nematic ordering [1]. The neo-classical theory of the elasticity of nematic elastomers is derived via the minimization of this Landau free energy; this neo-classical theory contains the classical theory of rubber elasticity as its isotropic limit. Our work not only reveals the statistical-mechanical roots of these elasticity theories, but also demonstrates that they are applicable to a wide class of random solids. It also constitutes a starting-point for the investigation of sample-to-sample fluctuations in various forms of vulcanized matter. [1] X. Xing et al., cond-mat/0411660

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