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Soft random solids and their spatial elastic heterogeneity XIAOMING MAO, PAUL GOLDBART, University of Illinois at Urbana-Champaign, XIANGJUN XING, Syracuse University, ANNETTE ZIPPELIUS, University of Goettingen — As a consequence of the disorder that is quenched in at synthesis, random solids are spatially heterogeneous, not only in their structure but also in their response to external conditions. For the case of soft random solids, the heterogeneity in the elasticity is particularly intriguing, owing to its entropic origin and the interplay with incompressibility. We have examined the issue of heterogeneity in the elastic properties of soft random solids by applying replica statistical mechanics to a semi-microscopic model of a random network medium [1]. We have characterized the elastic heterogeneity by random residual stress and Lamé coefficient fields, and have determined the statistics of these quantities. We have found that correlations involving the residual stress field are long ranged, and are governed by a universal parameter that also determines the mean shear modulus. Non-affine elastic deformations in soft random solids can also be also studied within this framework. [1] X. Mao, P. M. Goldbart, X. Xing and A. Zippelius, *Europhys. Lett.* 80, 26004 (2007).

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