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Nota di contenuto	Contents; 1 A bird's eye view of liquid crystal elastomers; 2 Liquid crystals; 2.1 Ordering of rod and disc fluids; 2.2 Nematic order; 2.3 Free energy and phase transitions of nematics; 2.4 Molecular theory of nematics; 2.5 Distortions of nematic order; 2.6 Transitions driven by external fields; 2.7 Anisotropic viscosity and dissipation; 2.8 Cholesteric liquid crystals; 2.9 Smectic liquid crystals; 3 Polymers, elastomers and rubber elasticity; 3.1 Configurations of polymers; 3.2 Liquid crystalline polymers; 3.2.1 Shape of liquid crystalline polymers; 3.2.2 Frank elasticity of nematic polymers 3.3 Classical rubber elasticity3.4 Manipulating the elastic response of rubber; 3.5 Finite extensibility and entanglements in elastomers; 4 Classical elasticity; 4.1 Deformation tensor and Cauchy-Green strain; 4.2 Non-linear and linear elasticity; 4.3 Geometry of deformations and rotations; 4.3.1 Rotations; 4.3.2 Shears and their decomposition; 4.3.3 Square roots and polar decomposition of tensors; 4.4 Compressibility of rubbery networks; 5 Nematic elastomers; 5.1 Structure and examples of nematic elastomers; 5.2 Stress-optical coupling; 5.3 Polydomain textures and alignment by stress 7 Soft elasticity7.1 Director anchoring to the bulk; 7.1.1 Director

rotation without strain; 7.1.2 Coupling of rotations to pure shear; 7.2 Soft elasticity; 7.2.1 Soft modes of deformation; 7.2.2 Principal symmetric strains and body rotations; 7.2.3 Forms of the free energy allowing softness; 7.3 Optimal deformations; 7.3.1 A practical method of calculating deformations; 7.3.2 Stretching perpendicular to the director; 7.4 Semi-soft elasticity; 7.4.1 Example: random copolymer networks; 7.4.2 A practical geometry of semi-soft deformation; 7.4.3 Experiments on long, semi-soft strips  
7.4.4 Unconstrained elastomers in external fields  
7.5 Semi-soft free energy and stress; 7.6 Thermomechanical history and general semi-softness; 7.6.1 Thermomechanical history dependence; 7.6.2 Forms of the free energy violating softness; 8 Distortions of nematic elastomers; 8.1 Fredericks transitions in nematic elastomers; 8.2 Strain-induced microstructure: stripe domains; 8.3 General distortions of nematic elastomers; 8.3.1 One-dimensional quasi-convexification; 8.3.2 Full quasi-convexification; 8.3.3 Numerical and experimental studies; 8.4 Random disorder in nematic networks  
8.4.1 Nematic ordering with quenched disorder

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### Sommario/riassunto

This text is a primer for liquid crystals, polymers, rubber and elasticity. It is directed at physicists, chemists, material scientists, engineers and applied mathematicians at the graduate student level and beyond.

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