Deformation and Viscoelastic Behavior of Polymer Gels in Electric Fields

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“Smart” polymer gels actively change their size, structure, or viscoelastic properties in response to external signals. The stimuli-responsive properties, indicating a kind of intelligence, offer the possibility of new gel-based technology. The article attempts to review the current status of our knowledge of electromechanical effects that take place in smart polymer gels. Deformation and the mechanism of polyelectrolyte gel behavior in electric fields are first studied experimentally and then theoretically. In particular, the swelling or bending is discussed in detail. Particulate composite gels whose modulus of elasticity can vary in electric fields are revealed as a new smart material. The driving force causing varying elastic modulus in electric fields is explained by a qualitative model based upon polarized particles. Finally, applications of the two electromechanical effects are presented.

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