

The University of Texas at San Antonio

UTSA Physics and Astronomy



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Friday, October 12th, 2018

FLN 2.02.06

3:00 PM

Some New and Unusual Observations Regarding Poly (acrylic acid) Gels and Fibers and Possible Connections to Physiological Phenomena

Poly(acrylic acid) (PAA) gels have been of broad scientific interest due to large volumetric changes that can accompany changes in pH or monovalent/multi-valent cation exchange, and as a possible crude mimic of cytoskeletal proteins. In collaboration with colleagues in the Department of Pediatric Neurology, it has been verified that PAA gels can exhibit large, static electrical potentials of up to -100 mV, leading us to investigate the effect of bathing salt composition and concentration on the magnitude of the potential. Specific attention has been directed to the influence of the bathing anion, and especially interesting effects have been observed that will be discussed in the context of counterion condensation phenomena. Possible connections to important biological processes will be outlined, including a proposed involvement of macromolecules in the process of nerve signal conduction. In a separate but related study, we investigated the synthesis of PAA gels in the presence of various added salts, which has led to a variety of materials with interesting elastic and viscoelastic properties. For example, selected materials can reach reversible strains of > 2,000%. A summary of property characterization of this new class of soft materials, along with our current thinking on the origin of super-elasticity, will be presented.

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