Title
Dynamic property of sodium poly-acrylate gel particles studied using a two-photon fluorescence microscope

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Abstract

The contraction of sodium poly-acrylate gel particles, average size of 70 to 100 microns, was found to be entirely dependent upon electrogenerated species generated at optically transparent tin oxide electrodes or at polycrystalline platinum electrodes. The pH-dependant dynamic fluorescent experiments correlate the timing and extent of the contraction of the gels to that of electrogenerated proton waves (pH gradient). Attempts to invoke contraction using pure electric fields (in the absence of Faradaic currents) failed to induce any volume change to the gel particle with externl fields as large as 435 volts. Composition of the electrolyte solution was found to affect the rate at which the proton wave migrated through the electrochemical cells - as expected from Nernst-Planck theories of migration. By using pH sensitive fluorescent probe and the line scan mode of the two-photon fluorescence microscope, we were able to image and study the dynamics of the gel particle as the pH wave front moving across the field of view. We found a monotonic correlation between the pH and the size of the gel particle. This work was supported by NIH grants PHS 5 P41 -RRO3155 and PHS 5 P41 -RR05964.