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Equilibrium and Kinetic Water Uptake in Ultrathin Chitosan Films CHRIS MURRAY, JOHN DUTCHER, University of Guelph — We present the results of ellipsometry and surface plasmon resonance experiments of equilibrium and kinetic water uptake in ultrathin films of chitosan that have been prepared by spincoating from dilute solution. Exposure of the films to increasing relative humidity results in increases in thickness and mass due to the absorption of water from the surrounding atmosphere. The equilibrium water content measured at different RH values can be interpreted in terms of either the average size of water clusters forming within the polymer matrix, or multilayers of water adsorbed onto specific sites within the matrix. Measurement of the time-dependence of water uptake allows the calculation of the diffusion coefficient of water in the films. We observed dramatic reductions in the water uptake of chitosan films that have been heated to temperatures 150 ^{o}C $< \quad T \quad <$ 200 ^{o}C: the equilibrium water content is reduced by more than a factor of four and the diffusion coefficient of water in the films decreases by more than a factor of two. We suggest that this irreversible reduction in the equilibrium water content and the diffusion coefficient for water in the films is caused by the formation of new inter- and intra-molecular bonds within the polymer matrix, and we present one possible mechanism that is consistent with all of our observations.

John Dutcher
University of Guelph

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