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pH-Responsive Swelling of PAMAM Dendrimer-Gels. RONALD HEDDEN, BURCU UNAL, Penn State University — End-linked hydrogels containing high mass fractions of amine-terminated poly(amidoamine) (PAMAM) dendrimers are prepared by reaction of dendrimers with monodisperse, epoxide-terminated linear poly(ethylene glycol) chains. PAMAM dendrimers impart pH-dependent swelling characteristics to the gels, which absorb large amounts of water due to protonation of the dendrimers' amine groups under neutral or weakly acidic conditions. The equilibrium swelling of the gels passes through a maximum at pH of approximately 4.5, due to extensive protonation of the amine groups. Interestingly, the equilibrium swelling ratio is markedly lower at both high external pH and low external pH. We model the swelling behavior by invoking the Donnan equilibrium theory, treating the gels as phantom networks that contain a high concentration of Lewis bases having pKb=3.5 The model captures the maximum in swelling near pH=4.5, though equilibrium swelling ratio is overpredicted in some cases. The collapse of the gels at both high and low external pH is explained in terms of the differential between the concentrations of mobile ions inside and outside the gel. We will discuss recent attempts to prepare stimuli-responsive gels based upon the remarkable swelling characteristics of PAMAM dendrimer-gels.

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