

Development of Intelligent Drug Delivery Systems using Polymer Hydrogels

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pH-Sensitive hydrogels are suitable candidates for developing controlled release systems due to their unique ability to exhibit altered structures or modified conformations in response to the external pH changes, leading to a controlled release profile. Here, pH-sensitive hydrogels of poly(methacrylic acid) grafted with poly(ethylene glycol) were prepared via free-radical photopolymerization. These poly(methacrylic acid-g-ethylene glycol) hydrogels showed sharp transitions at a pH of around 5. These sharp transitions between the collapsed and the swollen states indicate that these systems can swell and collapse rapidly, responding to their environmental pH changes. Thus, if the pH of the microenvironment of the gel is very close to the transition, a very small increase of the pH can induce the gels to swell completely, leading to release of the drug from the hydrogel. Using this behavior, we are developing the on-off switches for the release of physiological active materials such as peptides, proteins, and cosmetic agents.