

Preparation and Application of Photo-Stimulated Multi-Responsive Gels

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Fluorescent gels with three-dimensional cross-linked networks and tunable luminescence represent an important class of smart materials. Herein, we develop a single light-triggered multi-responsive gel by incorporating photoacid generators (PAG), dual-state emission fluorophores (CP), and polyelectrolyte groups (NASS) into a polyacrylamide matrix. The gel exhibits simultaneous color, fluorescence, and volume responses upon light irradiation. The NASS-induced polyelectrolyte effect enables acid-triggered volume shrinkage, which is converted into non-contact photoresponsiveness by PAG. Benefiting from the photochromism of PAG, the gel changes from yellow to light pink under light. The dual-state emission fluorophores display distinct fluorescence behaviors: dispersion-state molecules undergo FRET with PAG, while aggregated-state molecules do not. Solvent exchange further modulates fluorescence responses: the gel in DMSO switches from yellow to blue fluorescence upon irradiation, whereas the hydrogel retains constant yellow fluorescence. This work demonstrates that the integration of PAG, dual-state fluorophores, and polyelectrolytes successfully endows the gel with light-induced multi-responsiveness, showing promising applications in biomimetic actuation and information encryption.

Keywords:

Multi-Responsive, Fluorescent gels

References:

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