

Starch-Integrated Amine-Functionalized Terpolymeric Hybrid Gels: Role of Functional Groups in Swelling, Elasticity, and Tartrazine Adsorption

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Multi-responsive hybrid hydrogels and cryogels were designed by incorporating corn starch (CS), a homopolysaccharide, varying amounts into the cationic terpolymer poly(dimethylamino ethyl methacrylate-co-glycidyl methacrylate-co hydroxypropyl methacrylate) (DMAEMA-co-GMA-co-HPMA) by free-radical crosslinking (cryo)polymerization of the crosslinker diethyleneglycol dimethacrylate (DEGDMA) in aqueous solution. For producing multicomponent networks, starch-integrated amine-functionalized terpolymeric hybrid hydrogels and cryogels were synthesized at 8 °C and -18 °C, respectively. Hybrid gels were prepared by the feeding mole ratio DMAEMA/GMA/HPMA: 70/10/20, to investigate the effect of hydroxyl groups in the structure of CS on cationic ternary gel matrix properties. Structural characterization was performed using ATR-FTIR, XRD, DSC, and TGA, and mechanical properties, dynamic/equilibrium swelling behavior, and dye-adsorption mechanisms of hybrid gels were investigated. Due to their exceptional ability to form well-structured gel networks, the effect of the increase in starch content on the water uptake rate, gel elasticity and equilibrium swelling degree was investigated depending on the hybrid composition.

Keywords: Starch, Cationic hydrogel, Swelling, Adsorption, Multiresponsive Network, Amine-functionalized gel, Bio-based polymeric network.

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