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A pH-, salt- and solvent-responsive carboxymethylcellulose-*g*-poly(sodium acrylate)/medical stone superabsorbent composite with enhanced swelling and responsive properties

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Abstract. Free-radical graft copolymerization among sodium carboxymethylcellulose (CMC), partially neutralized acrylic acid (NaA), medical stone (MS) and crosslinker *N*,*N*′-methylene-*bis*-acrylamide (MBA) was performed to prepare new carboxymethylcellulose-g-poly(sodium acrylate)/medical stone (CMC-*g*-PNaA/MS) superabsorbent composites. Fourier transform infrared (FTIR) spectra, thermogravimetry- differential scanning calorimetry (TG-DSC) and field emission scanning electromicrsocopic (FESEM) analysis confirmed that NaA had been grafted onto CMC backbone and MS participated in polymerization, and the thermal stability and surface morphologies were improved by the addition of MS. Energy dispersive spectrometer (EDS) and elemental map (EM) analyses revealed the better distribution of MS in the CMC-*g*-PNaA matrix. The incorporation of 20 wt% MS clearly enhanced the water absorption by 100% (from 317 to 634 g/g). The developed composites showed enhanced swelling rate and On-Off switching swelling characteristics in various pH solutions, saline solutions and hydrophilic organic solvents, which represented interesting and reversible pH-, saline- and hydrophilic organic solvent-responsive characteristics. In addition, the composite exhibited intriguing time-dependent kinetic swelling properties in various heavy metal solutions.

Keywords: *polymer composites, carboxymethylcellulose, medical stone, superabsorbent, smart-responsive swelling*

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