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Understand how the magnetic nanoparticles influence the thermal stability and structural properties of hybrid nanocomposite hydrogels

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The use of magnetic and biodegradable polymers capable of removing soluble pesticides can reduce damage to the environment and human health caused by their presence in rivers and lakes. The objective of this work is to understand if the presence of magnetite nanoparticles, functionalized or not with 3-aminopropyltriethoxysilane - APTES, influence the thermal and structural properties of new magnetic hydrogels based on carboxymethylcellulose polysaccharide and zeolite, supported in poly(methacrylic-co-acrylamide) networks. X-ray diffraction (XRD) technique and thermogravimetric analysis (TG) were used to investigate the structure, crystallinity, and thermal stability of these magnetic nanocomposites. XRD profiles of the hydrogels and nanocomposite hydrogels (with magnetic nanoparticles) are very similar, except for the peak at 2 delta = 35.57 degrees (plane (311) of the magnetite). This indicates that the structural properties were preserved after both nanoparticle type addition. In addition, all matrices are predominantly amorphous. These characteristics were already expected, whereas both hydrogel and their nanocomposites have high chain entanglements. The presence of magnetic nanoparticles did not cause a significant change in the thermal stability of the nanocomposites. Finally, the nanoparticles only slightly increased the sorption of paraquat by the nanocomposites, reaching around 13 mg/g after 8 hours. From these results, one can conclude that despite the magnetic nanoparticles incorporated not provoking considerable changes in the network properties, it confers magnetic properties to the matrix, having the advantages of easy and safe removal from the environment. These nanocomposites are potentially viable for application as sorbent of pesticides, dyes, heavy metals, and other pollutants from water contaminated.