Synthesis of poly(acrylonitrile-co-divinylbenzene-co-vinylbenzyl chloride)-derived hypercrosslinked polymer microspheres and a preliminary evaluation of their potential for the solid-phase capture of pharmaceuticals

ABSTRACT

Poly[acrylonitrile (AN)-co-divinylbenzene (DVB)-co-vinylbenzyl chloride (VBC)] terpolymers were synthesized by precipitation polymerization in the form of porous polymer microspheres. The poly(AN-co-DVB-co-VBC) polymers were then hypercrosslinked, via a Friedel-Crafts reaction with FeCl3 in nitrobenzene, to provide a significant uplift in the specific surface areas of the polymers. FTIR spectra of the hypercrosslinked poly(AN-co-DVB-co-VBC)s showed that the chloromethyl groups derived from VBC were consumed by the Friedel-Crafts reactions, which was consistent with successful hypercrosslinking. Hypercrosslinking installed a number of new, small pores into the polymers, as evidenced by a dramatic increase in the specific surface areas upon hypercrosslinking (from ~530 to 1080 m2 g−1). The hypercrosslinked polymers are very interesting for a range of applications, not least of all for solid-phase extraction (SPE) work, where the convenient physical form of the polymers (beaded format), their low mean particle diameters, and narrow particle size distributions, as well as their high specific surface areas and polar character (arising from the AN residues), make them attractive candidates as SPE sorbents. In this regard, in a preliminary study one of the hypercrosslinked polymers was utilized as an SPE sorbent for the capture of the polar pharmaceutical diclofenac from a polar environment.

Keyword: Diclofenac; Hypercrosslinked terpolymer; Polar pharmaceuticals; Polyacrylonitrile; UV absorption