AN INVESTIGATION INTO THE BINDING OF THE BIOLOGICALLY IMPORTANT IRON PROTOPORPHYRIN IX HYDROXIDE MOLECULE TO NOVEL CO-POLYMER MICROGELS USING MÖSSBAUER SPECTROSCOPY

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Abstract

The synthesis of three novel copolymer microgels incorporating either 1% w/w vinyl imidazole, allyl methyl sulphide or allyl suphide is reported. Microgels were prepared using a standard surfactant free emulsion polymerisation method adapted from the procedure described by Pelton & Chibante. Photon correlation spectroscopy (PCS), transition electron microscopy (TEM) and high sensitivity differential scanning calorimetry (HSDSC) were used to analyse the physico-chemical properties of the resultant particles.

The incorporation of co-monomers confers new functional groups into the matrix. In the case of the vinyl imidazole, a pendant imidazole ligand, which is comparable to the proximal histidine residue, found in the heam centres of important biological proteins e.g. myoglobin, haemoglobin and related systems. The binding of iron protoporphyrin IX hydroxide (hematin) to the microgel will be reported. Quantitative measurements of the ratio of porphyrin to microgel are confirmed by electronic absorption spectroscopy according to the Beer's law and have been determined to be of the order of 100mg hematin/g microgel. Comparative adsorption measurements with the homopolymer microgel are also reported.

The analysis of the microgel-porphyrin complexes by Mössbauer spectroscopy is described using 57Fe enrichment of the hematin residue. Evidence for the binding of the functional group to the porphyrin and the co-ordination/spin state of the iron will also be reported.

Keywords: Microgel, Iron