Self assembled nanogels

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Amphiphilic molecules, such as surfactants or lipids, spontaneously self-assemble in water, forming self-aggregates, such as micelles, bilayer membranes, tubes and vesicles. Amphiphilicity of biopolymers is one of the important factors for their self-organization in water [1]. By self-assembling, the hydrophobic segments are segregated from the aqueous exterior, to form an inner core surrounded by hydrophilic chains. This kind of structure is suitable for trapping hydrophobic substances, such as fluorescent probes, proteins, and hydrophobic pharmaceuticals. Size, density and colloidal stability of nanoparticles can be controlled, by changing the degree of substitution of hydrophobes and its hydrophobicity. The association mechanism is mainly governed by the alkyl chain concentration and length and is little influenced by the molecular weight of the polymer backbone.
The amphiphilic molecule dextrin-VA-SC_{16} ($dexC_{16}$) was produced and studied in this work. $DexC_{16}$ has a hydrophilic dextrin backbone with grafted acrylate groups (VA), substituted with hydrophobic 1-hexadecanethiol (C_{16}). The dextrin degree of substitution with the hydrophobic chains (DS_{C16}, number of alkyl chains per 100 dextrin glucopyranoside residues) may be controlled. Materials with different DS_{C16} were prepared and characterized using ^{1}H NMR. $DexC_{16}$ self assembles in water through association of the hydrophobic alkyl chains, originating hydrogel nanoparticles. The properties of the hydrogel nanoparticle were studied by dynamic light scattering (DLS), fluorescence spectroscopy and atomic force microscopy (AFM). Nanostructures spontaneously form when the concentration of the polymer is higher than a concentration called critical micelle concentration (cmc). The self-assembly of hydrophobized dextrin in water ($dexC_{16}$) was investigated in this work. The structural change upon the dilution of the $dexC_{16}$ self-aggregates, in water, was investigated by fluorometry, in the presence of pyrene as the fluorescent probe. Other relevant properties of the nanoparticles, such as the size, stability, and shape were also evaluated in this work. Furthermore, the interaction of the nanoparticles with cells (fibroblasts and macrophages, studies on the biodistribution, intracellular trafiking, the encapsulation of therapeutic proteins such as IL10 and anticancer drugs such as curcumine were analysed [2,3,4,5,6]

References

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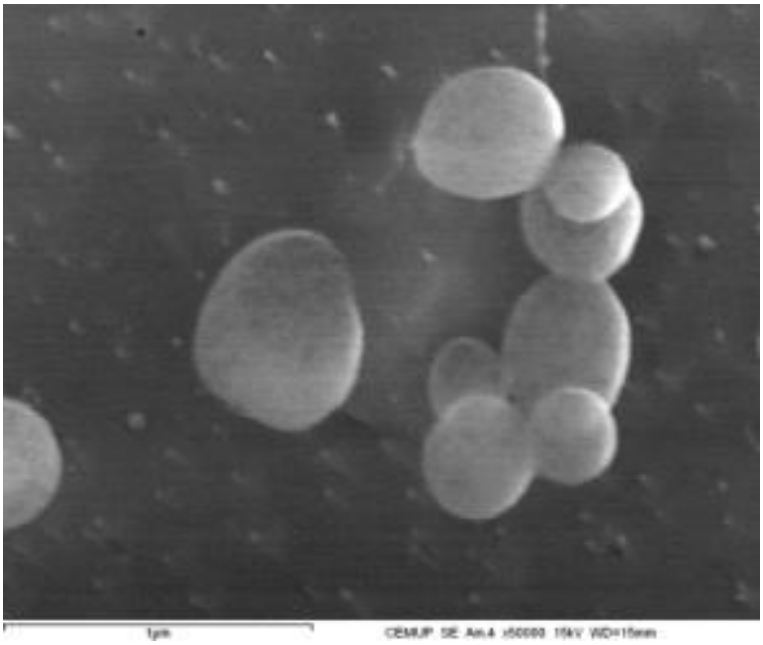
Figures



Cryo SEM images of dextrin nanogel