



Swelling of ionic and non-ionic

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Abstract

In this paper, non-ionic poly-N-isopropylacrylamide (PNIPAM) minigels and ionic imidazolium based minigels are used to study the swelling after addition of solvent. The diffusion coefficients for swelling are calculated using Tanaka's model. They are of the same order of magnitude of those reported for macro and microgels and far from that of water self-diffusion. The presence of charge for ionic minigels allows swelling control through the ions present in the surrounding solvent.

Key words: *Microgel, Nanogel, Minigel, Gel, Polymer, Colloid*

1. Introduction

Polymer gels are cross-linked polymer networks that have the ability to change their volume by absorption of solvent and in response to external stimuli. Here, we show that the wetting kinetics of both the ionic and non-ionic minigels can be described with Tanaka's model. The diffusion coefficients for the minigels are of the same order of magnitude of those reported for macro and microgels and far from that of water self-diffusion. The presence of charge on the polymer network, makes its diffusion dependent on the ions present in the surrounding solvent.

2. Experimental

2.1. Systems

Non-ionic PNIPAM minigels are synthesized by inverse polymerization, following a modification of the procedure established by Dowding et al., The main monomer, cross-linker, and initiator are N-isopropylacrylamide (Aldrich, 5.0046 g), N,N'-

methylenbisacrylamide (Fluka, 0.1548 g), and potassium persulfate (Fluka, 0.3523 g), respectively. The cross-linker concentration ends up being ~3 wt %.

Once the particles are formed, the suspension is allowed to sediment and the surfactant removed by rinsing with pure n-heptane. This procedure was repeated five times. We then dilute the suspension with deionized water and placed it on a rotary-evaporator at 50°C to remove the organic phase. The minigel particles in the aqueous phase are left behind. The final step is to eliminate any organic traces by rinsing several times with deionized water.

Ionic Imidazolium Based minigels were synthesised by polymerization of 3-ethyl-1-vinyl-1H-imidazol-3-ium bromide (Marcilla *et al.*, 2006). Cross-linked poly (3-ethyl-1-vinyl-1H-imidazol-3-ium bromide), [poly(ViEtIm⁺-Br⁻)], minigels are prepared with water-in-oil (W/O) concentrated emulsion pathway. N,N'-methylene-bisacrylamide (BA) was added as cross-linking molecule. The emulsion was homogenized under magnetic stirring and purged with nitrogen gas to remove any residual oxygen. After 1 h of reaction at room temperature, the