CHAPTER 11

Thermosensitive Hydrogels for Drug Delivery and Tissue Engineering

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Introduction

Thermosensitive hydrogels are categorized as second generation hydrogels as they have the ability to respond to a change in environmental condition, the temperature. They show a significant change in properties upon a small or modest change in temperature. Because of this unique characteristic they are also called "smart" hydrogels and have attracted increasing interest in wide range of pharmaceutical and biomedical applications such as drug delivery, protein and gene delivery, tissue engineering and tissue regeneration (Gandhi et al. 2015; Hrubý et al. 2015). Thermosensitive hydrogels maintain a solution status at or below room temperature, which allows easy handling, allowing easy administration through syringe and needle and transform into gel state at body temperature forming a high viscosity and sustained release depot (Ruel-Gariépy and Leroux 2004; Lai et al. 2014). The sol-to-gel transition of these polymers is described typically by phase diagram as a function of concentration and temperature (Fig. 1).

Phase diagram on the left (Fig. 1) is characterized by the lower critical solution temperature (LCST) suggesting that the transition from sol-to-gel occurs with increasing temperature. Whereas, the phase diagram on right (Fig. 1) represents phase transition occurring upon cooling and therefore are characterized by upper critical

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