weight/volume, tube dimensions (ChangYang et al. 2007; Jeong et al. 2012) and heating method could influence the accurate measurement of the sol-gel transition temperature and therefore it is important to keep these parameters constant to obtain comparable results.

Other factors such as copolymer concentration, copolymer chemical composition, presence of salts and other additives affects the phase transition temperature and therefore the performance of the hydrogel system. The effects of these factors are covered by Boffito et al. in their review (Boffito et al. 2015). Other method described in the literature is the stirrer bar method. A formulation containing a magnetic stirrer bar is heated up slowly and the gelation temperature is defined as the temperature at which the stirrer bar stops rotating (Yong et al. 2001; Dumortier et al. 2006; Yuan et al. 2012). However the mechanical force offered by the rotating stirrer bar might interfere with the accurate measurement of the gelation temperature. The gelation temperature of thermosensitive hydrogels could be modulated by chemical modification: adjusting the ratio of the hydrophobic/hydrophilic components results in the change in their gelation temperature (Sang et al. 2005; Jiang et al. 2007).

Thermal properties

Thermal properties of thermosensitive hydrogels can be studied by differential scanning calorimetry (DSC) (Ankareddi and Brazel 2007; Fu et al. 2009; Gai et al. 2015; Gong et al. 2009a; Liu et al. 2007; Piao et al. 2003; Wei et al. 2005; Zhang et al. 2004a). DSC is a thermoanalytical technique that is widely used for testing polymer thermodynamic properties by detecting the heat transition. Glass transition temperature (T_g) and melting temperature (T_m) of thermosensitive hydrogels can be determined by the heat changes of endothermic or exothermic reactions when the phase transition (sol-to-gel) occurs. T_g of the hydrogels is determined by subjecting the polymer sample to heat/cool/heat cycle. The inflection point of the endothermic drift in the second heating curve of thermograms gives the T_g of the sample (Gai et al. 2015). It is important to know the thermal characteristics of copolymers as it helps in understanding and adopting the correct method for their solubilization, particularly in case of semicrystalline polymers. It also provides information about the presence of interactions and interference from copolymer crystallization with gelation temperature (Lee et al. 2001). LCST of the polymer can also be determined by DSC analysis. A temperature ramp is performed at a defined heating rate under a flow of nitrogen; the temperature of the endothermic maximum obtained is referred as the LCST of the polymer. The effect of the crosslinking agents and other additives can also be investigated by this technique (Petrusic et al. 2012).

Rheological characterization

Rheological characterization of thermogelling systems is important as it will be helpful in determining their performance *in vivo*. The two main prerequisites of an *in situ* thermoresponsive system are viscosity and gelling capacity. The formulation should have optimum viscosity, which will allow easy administration as a solution and should show rapid change in viscosity at body temperature to transform into gel form. The flow