pore size, pore volume fraction, the interconnectivity of pores, crosslinking density and interaction between the polymer and macromolecules (Hoffman 2002). The best way to tailor the hydrogel porosity is by varying concentration of crosslinker. The concentration of crosslinker is indirectly proportional to the size of the gels. When pores are small, the gels might be stiffer and low swelling.

Various techniques such as solvent casting/particle leaching, gas foaming and freeze-drying have been developed to include micro or macro pores in the hydrogel. In solvent casting/particle leaching, polymer homogenous solution is mixed with porogens and solidified. In an appropriate solvent, the solid mass is immersed to dissolve porogens to create porous network (Ford et al. 2006). Alginate hydrogels are formulated by bubbling CO_2 gas into the hydrogel to create porous network. The average pore size created using this method is approximately 23–250 um (Partap et al. 2006). The most common technique used to create porous network is freeze-drying. The polymeric solution is rapidly frozen and lyophilized to form pores hydrogels.

Hydrophilicity and charge

Highly hydrophilic hydrogels contain large amounts of water, which helps cells to grow and proliferate efficiently. Also, these hydrophilic hydrogels degrade and release entrapped cells, drugs or growth factors (Kwon et al. 2000). For using synthetic polymers as scaffolds, charged gels show better cell proliferation than uncharged gels. It is also noteworthy that cells prefer positively charged scaffold surface for attachment due to electrostatic interactions (Schneider et al. 2004).

Biocompatibility

Biocompatibility is a key parameter one can consider when designing a biomaterial or a hydrogel. Any biomaterial, which helps for cell growth without causing any toxicity or immunological response, called as biocompatible material. Since these materials have constant interactions with surrounding tissues, it is important that they should not trigger the immune system. While comparing synthetic polymers with natural polymers, all natural polymers have monomeric units similar to native ECM that are more biocompatible than synthetic polymers (Lee and Mooney 2001).

Biodegradability

Biodegradation is another important parameter to be considered while designing any hydrogel. The degradation of material over a period must be equal to or comparable to rate of tissue regeneration. In some cases, a slow rate of degradation restricts the native tissue regeneration (Nguyen et al. 2002). Hence the ideal property of hydrogel should be gradual degradation that helps native tissue growth. However, in certain applications such as cartilage or cornea tissue regeneration fast degradation is not required. In such applications, partial degraded material integrates with native tissue to provide support and helps to regenerate effectively. Biodegradation is a process where the three-dimensional network cleaves either by enzymatic degradation or