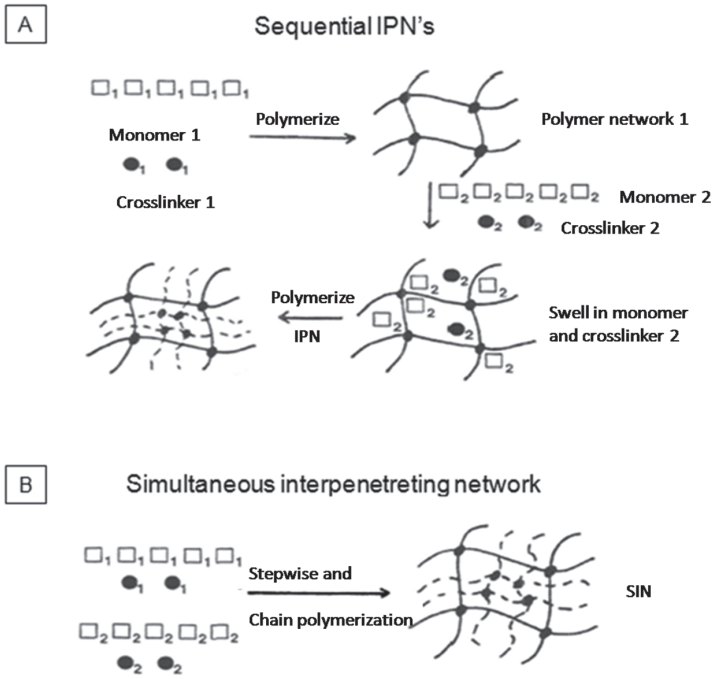

Fig. 26. Two methods of IPN synthesis: (A) sequential and (B) simultaneous (Adapted From Sperling 2011).

A particular class of compounds of this uptake method is represented by the Interpenetrating polymer networks (IPNs), which are capable to show a more efficient drug loading compared to conventional hydrogels. An interpenetrating polymer network is formed when a second hydrogel network is polymerized within an already synthesized hydrogel. Immersing a pre-polymerized hydrogel into a solution of monomers and a polymerization initiator typically does this. IPNs can be formed either in the presence of a cross-linker to produce a fully interpenetrating polymer network (full IPN) or in the absence of a cross-linking mechanism to generate a network of embedded linear polymers entrapped within the original hydrogel (semi-IPN), as illustrated in Fig. 26.

IPN is defined as polymer comprising two or more networks, which are at least partially interlaced on a molecular scale but not covalently bonded to each other and cannot be separated unless chemical bonds are broken (Sperling 1981; Donatelli et al. 1981). The main advantages of IPNs are that relatively dense hydrogel matrices can be produced which feature stiffer and tougher mechanical properties, more widely controllable physical properties, and more efficient drug loading. Drug loading is often performed in conjunction with the polymerization of the interpenetrating hydrogel phase (Mohamadnia et al. 2007). As an example, a lightly crosslinked chitosane-PNIPAM interpenetrating network significantly increased the loading capacity of diclofenac compared to a pure PNIPAM hydrogel (Alvarez-Lorenzo et al. 2005).