This means that any process of swelling, deswelling, reswelling, while always taking on the same polymeric structure by a chemical point of view, will take place on coils having different conformations, entanglements, interactions and bond strengths of both polymers and crosslinkers.

Drug Entrapment

Intimately connected with the process of swelling/deswelling is the mechanism of drug loading which is particularly important for what is one of the most important applications of hydrogels: drug delivery. Here we will discuss mainly the factors that govern the uptake of the drug into the hydrogel, and omit the issues related to the release of the drug from the same matrix. Drugs can be incorporated into hydrogel matrices by two ways (Lin and Metters 2006) (Fig. 25):

In the post-loading method the hydrogel matrix has been already formed. Generally the hydrogel, in the dry state, comes in contact with a solution containing the drug. The concentration of the solution becomes determinant. A high concentration of drug in solution increases its viscosity and delays the drug diffusion within the hydrogel. For an inert hydrogel system diffusion is the major force for drug uptake and depends on the gel swelling rate or the time it takes to reach equilibrium.

In the *in situ* loading, a polymer precursor solution is mixed with drug or drug-polymer conjugates with or without a crosslinker and allowed to polymerize, trapping the drug within the matrix (Kim et al. 1992). Hydrogel network formulation and drug encapsulation are accomplished simultaneously. The polymerization conditions may have deleterious effects on drug properties and the difficulties in device purification and polymers.

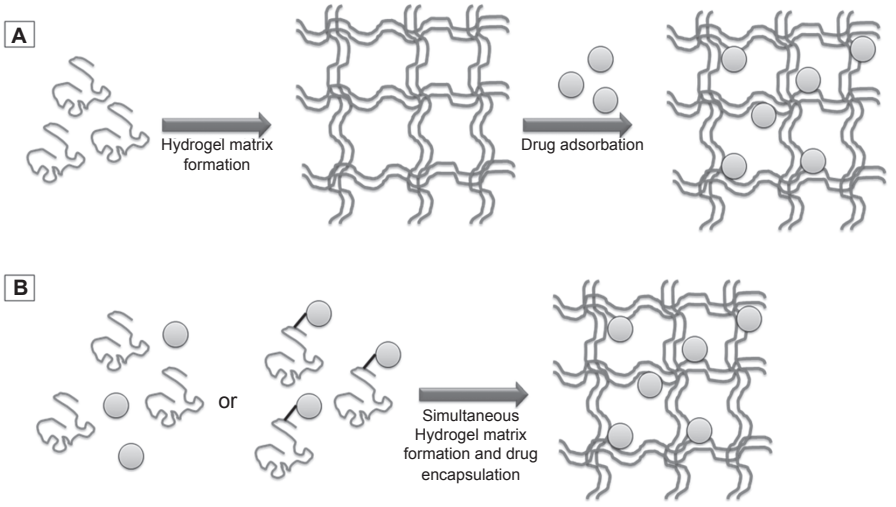

Fig. 25. Schematic representation of (A) post loading and (B) *in situ* loading of drugs into hydrogel network.