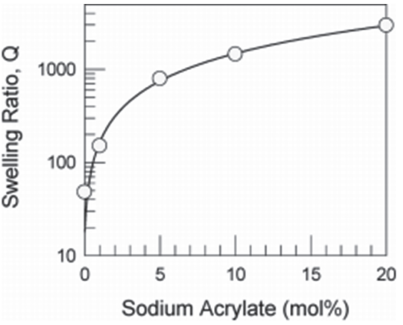

Fig. 19. Swelling ratio (mass of swollen gel/mass of dry sample) of DMAA-SA gels as a function of the sodium acrylate.

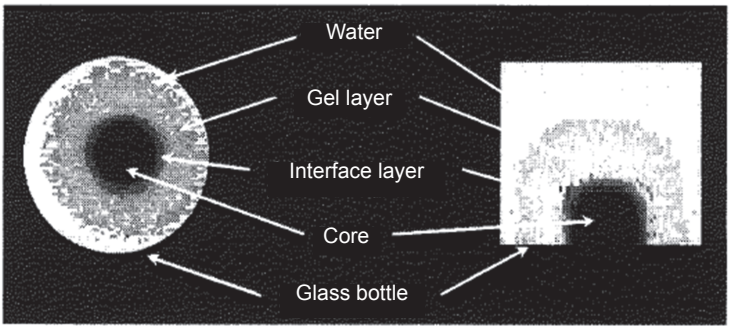

Fig. 20. Hydrating hydroxypropylcellulose (HPC) an interface between the dry core and the gel layer is evident (Adapted from Kojima et al. 1998).

forces, electrostatic forces and viscoelastic restoring forces are the three main forces governing the swelling behaviour of hydrogels. This process is determined, as we said, by several physicochemical factors particularly the sample/particle size, porosity extent and the type of the porous structure.

The diffusion into the hydrogel can be described as a diffusion of different species. A solvent (the swelling agent) has to diffuse into the hydrogel network, meeting the polymeric chains. Their mobility aids the penetration of water inside, through the pores. The relation between the relative rate of penetrant diffusion and relaxation of the polymer chain can be used to distinguish different types of time-dependences of degree of swelling (Q) even if the rate of the hydrogel swelling is mainly determined by how fast polymer chains can relax: Alfrey Jr. et al. have proposed three models for the swelling process (George et al. 2004).

1. Case I or Fickian diffusion: The diffusion is significantly slower than the rate of relaxation of the polymer chains. The change of the degree of swelling is determined by the diffusion of the swelling agent. The mass uptake is proportional to the square root of diffusion time, $Q \sim t^{1/2}$.