

that utilize this polymer may be clear or coloured with permitted pigments. The polymer is the subject of monographs in the major international pharmacopoeias.

Other cellulosic derivatives used in film coatings, which have similar properties to HPMC, include *methyl cellulose* (MC) and *hydroxypropyl cellulose* (HPC).

### Vinyl derivatives

The most commonly used vinyl polymer in pharmaceutical applications is *polyvinyl pyrrolidone* (PVP). Unfortunately, this polymer has limited use in film-coating formulations because of its inherent tackiness. A copolymer of vinyl pyrrolidone and vinyl acetate, *copovidone*, is considered a better film former than PVP. Another useful vinyl polymer is *polyvinyl alcohol* (PVA), a partial hydrolysate of polyvinyl acetate, which can be used to produce film coatings that have suitable mechanical properties and are highly adherent to pharmaceutical tablets. In addition, PVA exhibits good barrier properties to environmental gases (Okhamafe & York 1983) and water vapour (Jordan et al 1995).

Film coatings that use PVA as the primary polymer have mainly been exploited as special barrier coatings, helping to improve the stability of drug substances that are either sensitive to moisture (especially in countries that have humid climates) or are readily oxidized when exposed to atmospheric oxygen.

Recently, film coatings based on a copolymer of vinyl alcohol and ethylene glycol (Ziegler & Koller 2003) have become available. These coatings are less tacky than traditional PVA coatings and have the additional benefit of being extremely flexible, thus improving film robustness and allowing greater expansion capabilities should the tablet cores expand slightly during the coating process.

### Aminoalkyl methacrylate copolymers

These acrylic copolymers are readily soluble in aqueous media at low pH only, and thus are of prime importance in coating dosage forms where the need to achieve effective taste masking is a critical attribute (Dittgen et al 1997). These polymers are typically applied as solutions in organic solvents, although special forms may also be used to prepare aqueous polymer dispersions. An example of the molecular structure of this type of acrylic polymer is shown in Figure 32.5.

## Types of film-coating polymers: modified-release coatings

### Cellulose derivatives

As is the case with cellulosic polymers used in immediate-release applications, cellulosic polymers used for modified-release purposes are typically substituted ethers of cellulose. However, the level of substitution in this case is usually much higher, thus rendering the polymer insoluble in water. A typical example of such a cellulosic polymer is *ethyl cellulose* (EC), which is preferred for many extended-release applications (Porter 1989). Historically, ethyl cellulose has been applied as solutions in organic solvents, although aqueous polymer dispersions are commercially available.

Other cellulose derivatives used for modified-release applications include cellulose esters such as *cellulose acetate* (CA).

### Methylmethacrylate copolymers

Acrylic ester polymers are typically insoluble in water but can be prepared with varying degrees of permeability to render them suitable for a variety of extended-release applications (Dittgen et al 1997).

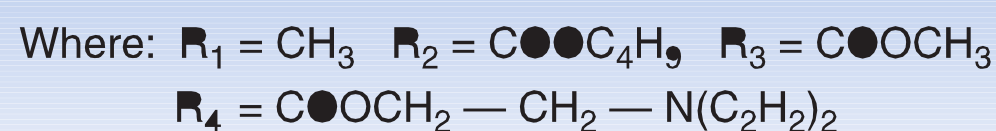
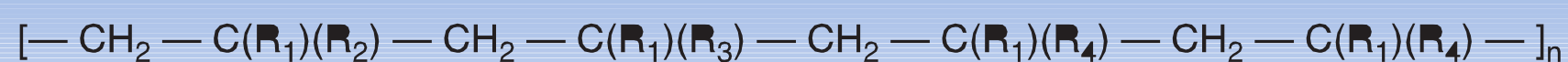


Fig. 32.5 • Aminoalkyl methacrylate copolymer.