

## Applications of polymers in photography

*Andrew M Howe*

Surface and Colloid Science Group,  
Kodak European R&D  
Harrow, Middlesex HA1 4TY,  
UK

[andrew.howe@kodak.com](mailto:andrew.howe@kodak.com)

Polymers play a variety of roles crucial to the manufacture and performance of photographic products. Perhaps the most important polymer in photography is gelatin, which is product of the careful hydrolysis of the structural protein collagen. After water, gelatin is the majority component of the fluids used in the multi-layer coating process used to manufacture photographic products. Gelatin plays key roles in the production of nanoparticles used to capture light and then to store the information required to produce the photographic image. These nanoparticles are crystals of silver halides, manufactured by a precipitation process in which gelatin acts as a peptiser and helps control growth. Gelatin assists in the formation and stabilisation of nanoparticles containing water-insoluble organics (colour couplers, stabilisers, UV absorbers etc) produced by processes such as homogenisation. Failure to stabilise nanoparticles would lead to aggregation that could result in the disruption of coating flows or provide visible defects in the final image.

In solution, gelatin provides viscosity to prevent sedimentation and give stable coating flows. It shear thins at high rates which can promote high coating speeds. Gelatin solutions can be gelled. On reducing temperature, physical gels are formed thermoreversibly, which can help storage or enable the locking of the layer structure in place and providing mechanical stability immediately after coating and during drying. After drying, gelatin provides a transparent, flexible protective layer for the imaging chemistry. After coating, gelatin molecules are covalently cross-linked to form a chemical gel that provides a network that maintains mechanical integrity during the reswelling procedure, which is essential for the image production during photoprocessing.

Other important applications of polymers are: in manufacture, for example high molecular weight polyanions can provide increased viscosity when the maximum concentration within a coating fluid is limited; for incorporation of materials into specific layers, for example organic materials within latexes; and for mechanical properties, where large latexes can be used as matting agents or small, soft latexes to give pressure relief.