



PAPER COATING CHEMICALS

Paper is manufactured from wood fiber slurries, fillers, sizing agents, and coatings. Sizing agents are used to provide resistance to the absorption of moisture or to eliminate ink feathering and bleed through. Selection of the specific sizing agents, fillers or coatings will depend on the final application for the paper.

Alkaline Papermaking

Alkaline papermaking refers to the formation of paper sheets from fiber slurries having a pH generally in the range of 7 to 9. Alkaline paper sheets typically contain some form of calcium carbonate filler, which would dissolve in the conventional acidic conditions. Water repellency in alkaline papermaking operations is usually achieved with synthetic sizing agents such as alkenylsuccinic anhydride (ASA) or alkylketene dimmer (AKD).

ASA Sizing Agents

The active ingredient of ASA is an oily monomer. The product is almost always delivered as a light amber oil that must be kept very dry until emulsification. ASA is added to the process in the form of an aqueous emulsion, in which the stabilizer is usually cationic starch and a small amount of surfactant to aid in emulsification.

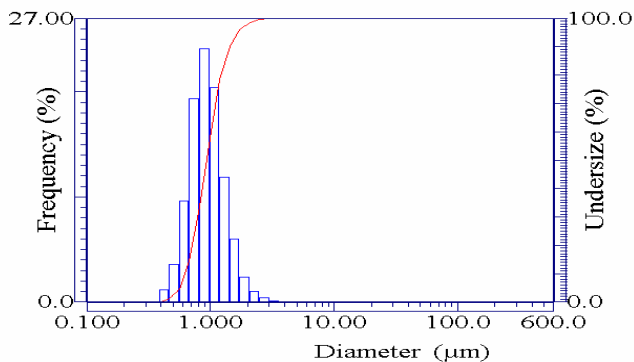
The key goals in using ASA are to avoid hydrolysis and distribute it well in the process. Hydrolysis is minimized

by preparing the emulsion as late as possible, usually only seconds before the material is added to the thin stock. Particle size analysis can show whether one has achieved the desired narrow size distribution of droplets, usually with an average size near or below one micrometer. Because of the instability of the emulsion, testing must be done at the point of use.



Horiba's LA-300 has proven to be extremely popular for this application because of its portability, fast analysis times, and ease of use. The example data shows an ASA emulsion tested in the field. The small size and low weight of the instrument allow it to be transported to various locations for routine testing of the emulsion preparation equipment.

ASA emulsion
Median: 0.885 μ m
D(10%): 0.598 μ m
D(90%): 1.345 μ m
Mean: 0.938 μ m





AKD Sizing Agents

AKD is synthesized from fatty acids. The most common form is a waxy solid material dispersed as small particles in a solution that contains a stabilizer, usually a cationic starch. Liquid forms of AKD have recently become available. Though slightly less efficient as a sizing agent than the waxy form, the liquid product does not make the paper as slippery.

AKD is used for hydrophobization of paper, especially when made under alkaline conditions. AKD is widely used for liquid containers, ink-jet printing papers, and many other grades of paper that need to resist water over a long period of time. Because AKD is received at the paper mill as a ready-made, milky emulsion, it can be a very convenient product to use. Also, the lower reactivity of AKD, compared to ASA, means that the papermaker has more flexibility on where to add it. In this case, it may be less necessary to test the product at the paper mill, although process control in the central manufacturing facility is still required. Horiba's LA-300 may still be more than sufficient, but the LA-930's greater range and lower limit may provide

Acidic Papermaking

For papers manufactured with a pH in the acidic range, rosin sizing agents are used, either an emulsion of the rosin acid or a saponified rosin soap. The word "rosin" refers to a series of chemicals isolated from the "tall oil" that is produced during kraft pulping of softwood species. Rosin acids are tacky solids at room temperature. To be used effectively in a paper machine, the rosin can be melted and emulsified in water, usually with a stabilizer additive. An alternative is rosin soap, which is formed by saponifying the rosin by addition of base so that it becomes soluble in water. The rosin soap is delivered to the mill as a liquid. In either case, the final emulsion can be tested for particle size to determine its stability and coating properties.



Horiba LA-930 Particle Size Analyzer

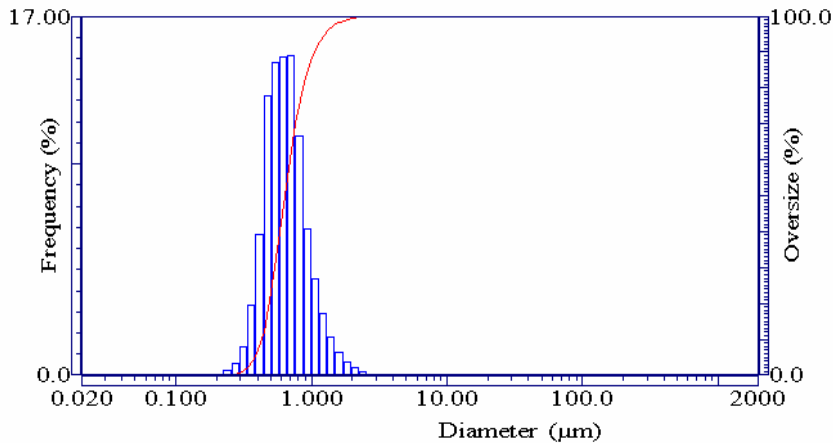


Fillers And Coatings

A number of additives are used in papermaking, from calcium carbonate used as a filler to a variety of minerals and latex added to the surface coating to improve brightness, gloss and printability. The selection of the additive depends on the surface finish required and the final use of the paper. Colored papers require the addition of a pigmenting agent. The particle size of all these materials affects surface finish, color strength, and mechanical

properties. Smaller particle size provides a smoother surface and better coverage per unit of additive.

Measurement of particle size can take place at the point of manufacture, such as a kaolin mining plant or pigment factory, or upon receipt at the paper mill as a final check. The example below shows kaolin tested on the LA-930. The size range of interest will dictate the model most appropriate for the application.



Kaolin
Median: 0.638µm
D(10%): 0.427µm
D(90%): 1.052µm
Mean: 0.701µm

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