Synthetic paper based on styrene

After earlier work with acrylic and polyolefin fibers, Japan's Toray Industries and Kanzaki Paper Mfg. Co. have opted for styrene copolymers as the basis for their first commercial line of synthetic paper products (C&EN, Sept. 23, page 8).

Unlike synthetic fibers in general, the Toray/Kanzaki polystyrene fibers resemble cellulose in that they are hy-

Fibers in synthetic blend (top) of about 75/25 wood pulp and polystyrene pulp are bound together much as wood pulp fibers are in natural paper (bottom)

drophilic. Also like cellulose, they tend to cohere once their surfaces are frayed by beating, and thus they can be formed into paper on conventional wet-forming paper machines in the same way as ordinary paper is made, without binders or heat treatment. In blends with wood pulp, the polystyrene is not a filler—as is generally true of synthetic/wood pulp mixtures—but binds together much as wood pulp fibers do when they are formed into paper. For these reasons, the Japanese developers maintain, theirs is the first genuine synthetic pulp.

Topka Corp., established by Toray and Kanzaki this month as a 50-50 sales venture, plans to develop markets for paper made of blended pulp—typically 10 to 30% styrene pulp mixed with wood pulp. The parent firms now can turn out 10 to 20 metric tons a month of paper from such blends on pilot-scale equipment. Topka will move into production if and as demand requires.

Price of the styrene pulp is about three times that of wood pulp currently, and Topka expects its paper products to be 10 to 50% more expensive than equivalent grades of ordinary paper. But the company claims an edge in physical properties for its blends, especially for thin printing paper. High brightness and opacity, attributed to the fibrillar structure attained by fraying, and high wet and flexing strength permit the use of thinner, lighter grades in high-performance applications than is practicable for ordinary paper. Or, conversely, paper of a given weight can be formed at higher speeds from blended pulp than from wood pulp. When discarded, further, Topka paper can be recycled or burned along with ordinary paper, whereas plastic film-type synthetic paper raises disposal problems.

Topka's sales target is high-quality specialty papers—for art printing, computer multiform printout paper, translucent and transparent paper, and industrial air or oil filters, among other uses. Kanzaki, a major Japanese producer of art paper and coated paper products, is no newcomer to such markets.

Toray, the other partner in the two-and-a-half-year development program that led to Topka's establishment, has concentrated on choice of fiber formulation and spinning methods to yield a hydrophilic, easily fibrillated material. Its hydrophilic fiber, averaging 4 or 5 microns in diameter, is first broken down by standard pulp-beating methods into fibrils of 1 or 2 microns in diameter. On the papermaking machine, bonding of hydrolyzed fibril surfaces and their physical entanglement bind the styrene fibers to cellulose fibers or to each other to form the paper matrix. Toray is continuing its work with hydrophilic polyolefin and acrylic pulps but has found that styrene pulps give whiter, more nearly opaque products.