ADHESIVES FROM NATURAL SOURCES – PRE-HISTORY TO THE PRESENT

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Throughout most of the 8,200 year history of adhesives, natural sources have dominated the adhesive chemist's stockpile of raw materials. Not until well into the 20th Century did synthetic raw material sources become important parts of the adhesive formulator's bag of tricks.

The earliest known human adhesive usage was recently discovered in artifacts found in caves surrounding the Dead Sea in Israel dating back a bit over 8,200 years ago. These crude adhesives fabricated from animal skins are the first documented human use of adhesives and the evidence suggested our ancestors were exceptionally clever in using these collagen based adhesives in a variety of applications. Closer to home, archeological evidence shows Native Americans in the PaleoIndian period used collagen based adhesives compounded with charcoal to adhere stone tips to weapons. In fact, naturally occurring adhesive raw materials so dominated adhesives for so long that as late as 1940, fully 95% of all raw materials used in adhesives were derived from natural sources.

Natural sources for adhesive raw materials are many and plentiful. The most important natural raw materials for adhesives include:

- Animal Collagen (animal, fish, etc.)
- Plant (starches, dextrin, cellulosics, etc.)
- Casein (milk protein)
- Silicate
- Bitumen
- Terpenes
- Rosins
- Natural Rubber

Starch has dominated this group for most of the last century, representing well over 80% of all consumption. By 1983, naturally occurring adhesive raw materials had dropped to 35% of total non-volatile adhesive consumption, which ultimately has dropped to about 30% today. While the percentage has dropped, natural raw materials have grown slightly in real volume during this latter period. The advent of synthetic polymer chemistry in the mid-1900's allowed for the introduction of synthetic polymers opening the floodgates of opportunities for adhesive formulators. Synthetic polymer chemistry offered a "boutique" approach where resins of specific properties could now be available and led to the "golden age" of adhesives beginning in the 1940's and continuing today.

The major reasons for the relative decline of natural raw materials might be associated with the diversity found in nature. Naturally occurring compounds exhibit much of the variability of life and present challenges to industry requiring uniformity and control. Even so, the economics of many natural products have endeared their place in adhesives history and they work very well for the applications they have settled into.

Perhaps the most exciting new trend in natural products research has been the development of new synthetic materials using these natural sources as starting points. Unique adhesive polymers have been synthesized using natural sources as starting points providing formulators with new and unique materials offering many of the advantages of naturally sourced compounds with the controlled structure of synthetic polymers.

Clearly, the relative decline of naturally sourced adhesive raw materials has slowed and may well begin to grow as innovative new raw materials emerge from laboratories offering unique new properties for adhesives. Environmentally benign adhesives are approaching commercialization bringing a new synergy between nature and organic synthesis only dreamed of a few short years ago.

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Bob joined ChemQuest in 1999 with 27 years experience in the Adhesives, Sealants and Coatings Industry. Prior to joining ChemQuest, he served as Business Manager and New Business Development Manager of Ashland Specialty Chemical Polymers & Adhesives Division. He brings with him extensive knowledge and experience in developing high-productivity sales and marketing teams, developing business processes, market assessment, competitive analysis and business modeling. His primary strategic focus has been in catalyzing growth through internal initiatives as well as business and technology acquisition, licensing and partnerships. He holds a B.S. in Chemical Natural & Synthetic Polymer Chemistry from SUNY College of Environmental Science & Forestry. Call Bob at (614) 792-3673 or rwsmith@chemquest.com.

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