Chemsultants International

UV-Curable Pressure Sensitive Adhesives

This whitepaper addresses a number of reasons why UV-curable pressure sensitive adhesives are becoming a growing adhesive technology in the pressure sensitive industry.

Chemsultants International Inc. • 9079 Tyler Blvd, Mentor, OH 44060 • (440) 974-3080 • chemsultants.com

UV-Curable Pressure Sensitive Adhesives and Chemsultants' Developmental Capabilities

UV-curable pressure sensitive adhesives possess proven performance advantages, yet many adhesive formulators have been forced to look for alternative adhesives due to the limited number of raw material availability and high raw material prices. Adhesive formulators often look toward more economical adhesive technologies, such as solvent-based, water-based, and hot melt adhesives.

Recently, however, more chemists and formulators have been considering UV-curable adhesives. EPA regulations have also helped ensure a healthy future for UV-cure pressure sensitive adhesives. Recent regulations are forcing adhesive users across a broad range of industries to switch to no- or low-VOC technologies such as UV-curable adhesives.

UV-Cure Pressure Sensitive Adhesive Introduction

Pressure sensitive adhesives are characterized by three main properties: tack, peel, and shear. Tack is the property related to bond formation. Peel is the force required to remove adhesive tape. Shear measures the flow property and characteristics of the pressure sensitive adhesive.

These properties are critical to a pressure sensitive adhesive's performance. Adhesive developers must take into account factors that can directly affect the properties, such as temperature, aging, film thickness, cure rate, and post-cure parameters when they develop or specify a specific adhesive. Formulation variables including oligomers selection, tackifier addition, monomer structure, molecular weight and glass transition that directly impact tack, peel, and shear must also be considered.

Despite these concerns and considerations, UV-curable pressure sensitive adhesives are becoming a growing adhesive technology in the pressure sensitive industry for a number of reasons.

Advantages of UV-Cure Technology

UV-cure pressure sensitive adhesives offer several advantages over conventional or solvent borne, water-based, or hot melt pressure sensitive adhesives. Recent growth in the UV pressure sensitive adhesive market can be attributed to three UV-cure benefits:

1. Improved Performance Properties

As the test results in this article will indicate, UV-curable pressure sensitive adhesives can be formulated and processed to deliver a broad range of performance properties, making them a viable option for many industrial applications. Of particular interest are specialty applications demanding high-temperature stability and solvent resistance. Choice of tackifier resin, monomer, and oligomers is critical in determining these performance criteria.

2. Simpler Environmental Compliance

Solvent borne pressure sensitive adhesive formulations traditionally based on modified rubber chemistry are now being challenged by government mandates requiring low-VOC standards. UV-cure pressure sensitive adhesives and other environmentally sound technologies enable formulators to meet these regulations.

For example, UV-curing waste can be disposed of as ordinary solid waste, increasing environmental safety and offering significant savings. Additionally, UV-pressure sensitive adhesives are generally safer for formulators to handle than the solvent materials they replace, offering less skin and eye irritation.

Environmental and safety benefits, coupled with the desire for fast-curing UV/EB systems, are creating a fast growth market for UV-curable pressure sensitive adhesives.

3. Reduced Prices

Formulators are beginning to realize that in the long run UV-curable pressure sensitive adhesives may offer a better value. Therefore, they are willing to pay for the performance they deliver. UV-curing decreases the drying time required to complete a process, which reduces the overall run time for a variety of applications. This, in turn, increases production capacity and throughput rates, requires less direct labor, and decreases downtime. In addition, UV-cure systems cost approximately 50% less than large capacity thermal systems. In addition to these benefits, raw materials prices for UV-cure pressure sensitive adhesives appear to be gradually declining and are expected to continue doing so in the next few years, which will increase the attractiveness of this system.

Future Growth

UV-curable pressure sensitive adhesives use an adhesive technology that will continue to grow due to ease of handling, the formulating latitude, and the environmental benefits of these solvent-free systems. The quick cure reaction also allows for extremely high-speed processing and the resulting cost efficiency. UV-curing is also a good fit for processing product substrates that are heat sensitive. Potential long-range applications of UV-cure pressure sensitive adhesives include both tape and label products.

Chemsultants' New Coating Line Emphasizes UV-Curing Capability

Chemsultants has installed a new coating line, TPC-1, in the 15,000 square foot product development pilot coating facility that is part of the new headquarters technology campus. The new multi-functional coater can be used to solve a wide range of printing, coating, saturating, compounding, and laminating problems and features a 24-inch width coating capability. A wide range of substrates including papers, films, foils, and non-wovens can be coated, dried, and laminated on the new line.

The coating line can be used to run initial prototypes for evaluation, production type samples for sales and marketing groups to take to customers, and initial start-up inventories. New products can be developed, compounded, and coated with a variety of coating heads to give the client all the basic information to move to full scale production of their new or modified product.

Fusion UV's F600 UV-curing equipment has been incorporated to provide UV-curing capability. UV-curable pressure sensitive adhesives that look promising in lab development may not be practical for production without further processing development. UV-cured pressure sensitive adhesives and silicone release coatings are of growing interest in the pressure sensitive adhesive industry. Chemsultants' newest pilot coating line can be used to prove that UV-technology works in a specific application and also for comparison to other more conventional chemistries.

For more information about how Chemsultants can help with your UV-curing needs, please contact us today!

Email: info@chemsultants.com
Telephone: (440) 974-3080
Fax: (440) 974-3081

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