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ASC members receive discount on new green adhesives and sealants market study

Offering several key advantages over conventional adhesives, green adhesives and sealants for industrial applications are projected to reach a value of nearly \$1.24 billion by 2017, according to a new study by IntertechPira. Published in association with the Adhesive and Sealant Council (ASC) and FEICA, ***The Future of Green Adhesives and Sealants for Industrial Applications*** provides a detailed analysis of the current and future demand for green adhesives and sealants over the next 10 years.

The Future of Green Adhesives and Sealants for Industrial Applications is available now for £3,500. Until May 31, ASC members are entitled to a **special 20% discount off the list price**. For further information or to order, contact Bill Allen at william.allen@pira-international.com.

Description of Report and Overview of Findings

Breaking down market forecasts by adhesive type, end use and geographic region, the study examines the latest technologies and the major drivers and barriers shaping the industry's future, with a view to identifying and evaluating possible strategies that could lead to their commercialization.

Green adhesives and sealants, as defined in this report, are products that reduce harm to the environment and that are either in development or have only recently been introduced to the market. Green adhesives and sealants include those with any of the following characteristics:

- Manufactured from sustainable raw materials, generally taken to mean materials based on renewable feedstock;
- Manufactured through an environment-friendly process (one that conserves materials and energy) and is safe and harmless to the environment;
- Have low volatile organic compounds (VOCs);
- Provide finished assemblies that are more environment-friendly (e.g., adhesives reduce the weight of automobiles which in turn improves fuel efficiency).

As such, bioderived adhesives (based on natural origins) have been there for over a century, with multi-pronged benefits like their relatively low cost, easy clean-up process (using detergent and water rather than organic solvents needed for synthetic petroleum-based adhesives), and minimal environmental impact. Over the next few years, IntertechPira foresees the co-existence of renewable plant resources with conventional, hydrocarbon ones.

Primarily based on starch, soy and vegetable oils, naturally occurring adhesives have had a history of commercial use and are being further developed to compete with petroleum-based adhesives. Bioderived polyols derived from agricultural feedstock such as soybeans can be effectively used in polyurethane adhesive and sealant formulations. These offer properties comparable to traditional adhesives, with several products now being commercially available. Other adhesive polymers that are being generated from vegetable oil derived building blocks include epoxies, polyamides and polyisoprene. Significantly, several new polymers capable of being used in adhesive formulations are produced from fermentation or microbial processes.

According to IntertechPira, green additives are being increasingly developed as it is advantageous to have adhesive formulation components derived from renewable sources. These include biosolvents, non-hazardous plasticizers, waxes from vegetable oil, cellulose fibres and rheology modifiers. Many additives are also being developed to provide biopolymers with enhanced properties to compete effectively with their petroleum-based counterparts.

Key environmental initiatives examined in this study include the development of adhesives directly based on naturally occurring high volume-based resources, new raw materials based on renewable and naturally occurring feedstock, development of adhesives and processes that improve end products environmentally to which they are applied, and all the potential industry end-use sectors.

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Indirect environmental effects mainly pertain to the impact that adhesives have on waste streams (with biodegradable or compostable adhesives developed to address this issue), environmentally acceptable design opportunities offered by adhesives relative to other methods of fastening, weight reduction in transportation vehicles (with the resulting savings in fuel cost) and the manufacture of alternative energy products such as wind turbine blades, solar panels and fuel cells.

The major value propositions supporting the development of green adhesives are primarily related to the prevention of pollution, energy consumption, efficient use of resources, and regulations and standards.

Usage of green adhesives technology imparts the following advantages to business, namely:

- Lower insurance costs as a result of reduced risk.
- Lower permitting and disposal fees as a result of reduced generation of hazardous waste.
- Reduced regulatory burden through elimination of stack and fugitive air emissions.
- Elimination of solvent capture, recovery and incineration equipment and avoided costs of emission control systems.
- Lower health and safety regulation costs (e.g., monitoring VOC concentration levels).

Acknowledging the significant role of the end-use sector in greening the adhesive industry, IntertechPira states that green activity would be mainly prevalent in heavily regulated industries, as also those industries whose products come in contact with the general public, and have the largest volume use of adhesive. Thus, sectors like packaging (laminating, hot-melt and tape-and-label adhesives), building and construction (green building standards for adhesives and sealants), woodworking (manufacture of wood composites as well as joining), transportation, shoe making, paper products and general assembly would show maximum green adhesive activity.

Synthetic, petroleum-based adhesive products that are supposed to be 'green' are based on either solventless liquid, waterborne, or 100% solid adhesive systems. The study goes on to add that over the last few years, 'green' adhesives have experienced a positive growth rate at the expense of solvent-based adhesive systems.

IntertechPira believes that though natural adhesives currently make up about 5% of the total adhesive market, this percentage could be actually misleading, since many natural raw materials are used as additives and modifiers in petroleum-based adhesive formulations. On an overall raw materials basis, natural components account for about 30% of all components used in adhesive formulations. With regard to future market trends, IntertechPira expects the natural adhesive market to grow slightly faster than the overall adhesives market in the 2007- 2017 period, with the annual growth rate of all adhesives conforming to the regional increase in gross domestic product (GDP).

Starch derivatives make up the majority of the natural adhesives that are used today, with approximately 65% of all natural adhesives based on starch derivatives, i.e. pure starch, modified starch and dextrin. IntertechPira forecasts that starch and other plant derived adhesives will experience single digit growth rates in the range of 3 to 4% over the next ten years, compared to the 2.7% growth rate expected for all adhesives, and the 3.1% growth rate expected for all natural adhesives.

With regard to starch adhesives, the bulk of development is expected to come from thermoplastic starches that can be used as hot-melt adhesives or transformed into waterborne dispersions. For other plant derivatives like soy and castor, oil, a significant development effort is taking place in the manufacture of polyols for use primarily in polyurethane adhesives and sealants. Similarly, derived waxes are also being used as plasticisers in hot-melt adhesive formulations. For natural adhesives that are based on cellulose derivatives, tree resins and their by-products, as well as natural rubber, low growth rates are envisaged, while the market for advanced bio-based adhesives is still in the early stages of development.

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IntertechPira is of the view that the new bio-based adhesives must be cost-competitive and provide performance-based properties that are equivalent to conventional adhesives. As of today, advanced bio-based adhesives are a small, almost insignificant, part of the overall market, with the study projecting that the market share of bio-based polymers will continue to remain negligible, i.e. in the order of 1–2% over the next few years and in the 1–4% range by 2020, with price and competitive performance playing a key role in this regard.

Looking ahead on the technology front, IntertechPira expects the continuing advancement of conventional, petroleum-based green adhesives, with a key focus area being the improvements made in the moisture resistance of waterborne adhesive systems through additives and surfactant technology. Further development in reactive hot-melt adhesives is also expected to lead to adhesives that can be applied via hot-melt processes, and also result in performance properties that are equivalent to conventional thermosetting adhesives.

The study also predicts that over time, the research priorities for biopolymer-based adhesives will be strongly influenced by the evolution of their product markets. In the years to come, scientists would also make significant advances in refining crops and in converting them into commercial products via green chemistry technology and bio-refineries, with the main research thrust focused on the development of economical, cost-effective production processes.

The formulation of adhesives using the raw materials produced by biopolymer manufacturers is also expected to be a key research area in future. Thus, adhesive manufacturers must work with raw materials suppliers and end users to ensure optimal performance levels, while offering more ecologically sound products that appeal to customers.

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IntertechPira provides market research, strategic and technical consulting to niche, emerging and high growth industries. Market coverage includes lighting and displays, clean energy, home and personal care, industrial biotechnology, performance materials and chemicals. IntertechPira is a division of Pira International.