in-adhesives 2024

Munich, February 6, 2024

Abstracts Day 1

in-adhesives
Symposium on Innovations in
Adhesives and their Applications

February 2, 2024

Dymax Europe

Dr. Thérèse Hémery

LIGHT CURING TECHNOLOGY – INNOVATIVE SOLUTIONS FOR MEDICAL WEARABLE DEVICE ASSEMBLY

Abstract

Medical wearables market needs, as well as customer requirements have become increasingly challenging over the last few years. While meeting the rapidly evolving trends in bonding, sealing, encapsulating, and coating, the product performance also plays a critical role in the assembly of medical devices, which are worn on the body for short- or long-term periods. To bond a variety of different substrates, including difficult to bond and low-surface-energy materials, Dymax has developed a new range of light curing products. These materials are formulated with (very) low-sensitizing ingredients and engineered for reliability with excellent adhesion and aging performance. They also pass rigorous skin sensitivity standards for medical wearable devices. These biocompatible UV-curable products are designed for the assembly and protection of sensitive circuitry and components and to perform at a more demanding level. Whilst driving the assembly process efficiencies to significantly increased capacity and productivity they can lead to possible production cost reductions of up to 30 %.

Collano

Dr. Raphael Schaller and Cornelia Javet

STICK & PLAY: CHEMICAL HOOK-AND-LOOP FOR SPORT AND MORE

Abstract

Our presentation delves into the persistent challenges posed by resin residues in handball sports facilities, highlighting the burdensome cleaning efforts and associated costs incurred by traditional resins and tree gum-based mixtures – despite their enhancement of ball control. In response to this issue, we introduced a novel solution inspired by the "hook-and-loop" concept, like Velcro® fasteners.

Our approach involves applying two specifically and attuned formulated adhesive components: one for the player's hands and the other for the ball. During play, these components combine to deliver optimal grip for maximum ball control without leaving resin residues on surfaces such as the floor, walls, goal frames, jerseys, and even hair.

The adhesive component for the hand is designed to meet cosmetic requirements, ensuring that it is skin-friendly, easily applicable and washable, dries rapidly, resistant to sweat, breathable, and maintains its efficacy for a half-time duration of 30 min in a handball game. Conversely, the ball adhesive component, in liquid form, exhibits robustness and stability during global shipment. Once applied and dried as a coating on the leather, it withstands humidity and temperature changes, presenting a high aesthetic appeal.

This well-matched system underwent extensive testing in handball. Other sports, like floorball and golf, were also explored. Moreover, there are considerations for potential medical applications and for labels and tape.

This presentation aims to showcase the journey of this radical development project, detailing challenges, failures, and successes and exploring potential applications in various sports and industries.

Jowat

Dr. Hartmut Henneken

DEVELOPMENT OF A NEW RECYCLING-FRIENDLY MULTICOPTER: HOW AN IDEA TOOK TO THE SKIES

Abstract

„Most multicopters have a relatively simple configuration and consist of semi-finished products and conventional or fiber-reinforced plastics (FRP). The production of FRP is energy-intensive and involves fossil raw materials as well as critical raw materials (e.g. catalysts made from bismuth or platinum). At the end of the service life of FRP components, the poor recyclability is problematic, as there are no complete material recycling processes.

It is generally recognized that it is becoming increasingly important to create more sustainable products and economic models. The HerMes project is developing a multicopter system with significantly improved sustainability. To this end, suitable materials and manufacturing processes based on renewable raw materials are being used. Wood and natural fiber-reinforced bioplastics in particular offer excellent structural-mechanical properties as well as good recyclability and cost efficiency. The use of such materials goes hand in hand with a more intensive application of bonding techniques. Conventional FRPs are virtually "overqualified" for all those applications in which their high specific strengths and stiffnesses significantly exceed the moderate load requirements. One example of this is smaller unmanned aerial systems, such as in the HerMes project. Wood and natural fiber materials have excellent specific strengths and stiffnesses that are comparable to those of aluminum and steel.

The multicopter is being developed from the outset with a view to later technical qualification in order to enable demanding and safety-critical applications, e.g. flight operations in SORA SAIL III/IV. In addition to the aeronautical development of the aircraft, the project tasks also include the development of advanced structural materials, new adhesive systems and surface protection agents based on renewable raw materials.

This presentation will provide a general overview of the project results. The focus is on the challenges and developments in the field of adhesives. The project was partially funded by the Federal Ministry for Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft) and Fachagentur Nachwachsende Rohstoffe e.V. (FNR) as project administration!”.

Polytec PT a part of ARKEMA Group

Dr. Arnaud Concord

HOW CAN THERMAL INTERFACE MATERIALS ENABLE HIGHER RELIABILITY IN ELECTRONIC APPLICATIONS?

Abstract

As electronic devices continue to decrease in size and experience consistent performance improvements, addressing the heat generated during their operation poses a significant challenge. Elevated temperatures can adversely affect the lifespan and performance of electronic devices. To mitigate this issue, the integration of Thermal Interface Materials (TIM) in electronic devices proves instrumental in reducing hot spots and facilitating the transfer of heat from the source to components like heat sinks. This, in turn, leads to an overall decrease in the device's temperature, enhancing both its longevity and performance.

Furthermore, the electronic industry faces an additional challenge of improving productivity efficiency within increasingly shorter cycle times. Consequently, TIMs must strike a balance between high performance and rapid processing. In response to this demand, Polytec PT, now part of Bostik and Arkema, has developed a silicon-free, light-curing solution that could be compatible with mass production, providing an effective solution for the industry's evolving needs.

Cargill

Erwin Honcoop

FUTURE HIGH-PERFORMANCE SOLUTIONS FOR ADHESIVES NEW TECHNOLOGY AS ANSWER TO ISOCYANATE RESTRICTION?

Abstract

In modern society the demand of smart and multi-functional adhesives is becoming continuously more important.

But today the market is also requesting solutions that can reduce the carbon footprint, have a concrete sustainability benefit and a potential alternative to the question on isocyanate restriction. Finding a reliable solution to provide performance and sustainability in one single solution is a major challenge.

Cargill is a leading global solution provider of high-performance building blocks that provide a variety of smart effects and benefits in a wide range of polymer types and applications.
Cargill has been working on an innovation that provides an answer to the restrictive requirements of the use of isocyanates. The potential offering has been evaluated, help our customers to tackle this challenge.

The use of this new technology can support the formulators to modify coatings and adhesive systems, offering flexibility, extreme hydrophobicity, improved flow and unique combination of improved adhesion to various substrates.

With our innovation we offer formulation freedom, enabling new and exciting high-end applications without the use of isocyanates for example in electronics, automotive and sportswear.

Cardolite Specialty Chemicals

Tom Berckmans*, Yun Mi Kim, Anbu Natesh

PERFORMANCE OF CASHEW NUTSHELL LIQUID BASED POLYOLS AND DILUENTS IN ELECTRIC VEHICLE BATTERIES

Abstract
Cashew nutshell Liquid (CNSL) is a non-food chain bio-based feedstock found in the honeycomb structure of the cashew (Anacardium Occidentale) nutshell. Versatile chemistries from CNSL allow the design of high bio-content hydroxyl functional molecules i.e., CNSL polyols, diols, and diluents.

In this paper, key properties of CNSL hydroxyl functional molecules were examined to identify utility of CNSL technology for electrical vehicles (EV) battery packages. CNSL diluents can lower viscosity and control cure speed while the diols and polyols enabled the optimization of strengths and flexibility of polyurethane adhesives. Outstanding hydrolytic stability, thermal and chemical resistances of CNSL-based polyols were demonstrated along with good dielectric properties and fire resistance

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Henkel

Dr. Uwe Franken*, Dr. Kim Kreisköther

DEVELOPMENT OF INNOVATIVE MATERIAL, TESTING METHODOLOGY AND SIMULATION MODEL FOR SAFE BATTERY SYSTEMS

Abstract
The topic of Thermal Propagation Prevention (TPP) is increasingly coming into focus in the e-mobility idustry. With an increasing number of reported cases of fire on electric vehicle roads, legislation in China has caught up and is placing new safety requirements on electric vehicle manufacturers, and NA and EU are expected to follow soon.
The presentation will provide an overview of thermal runaway and its propagation, efficient testing of battery systems under thermal runaway, thermal runaway simulation for best material selection and fire-protection material testing methods. Together with classical thermal management, bonding and sealing technologies and products, this will help that the safe integrity of the batteries meets and follows the regulatory requirements for prevention in electricity storage systems of a battery.

Füll Lab Automation

Benjamin Gmeiner

MODULES AND SYSTEMS FOR LABORATORY AUTOMATION

Abstract:
The potential applications of laboratory automation within the adhesives industry are highly diverse. With fully automated dosing of liquids and solids, a wide variety of adhesive

formulations can be produced. Moreover, subsequent steps like applying the produced adhesives in various forms, such as dogbones or thin adhesive films, can also be automated. To complete an end-to-end workflow, it is possible to automate the characterizing of adhesives, including measuring properties like viscosity, pH value, tensile strength, and tensile shear strength.

For example, a system for automatic adhesive formulation and application was developed for Henkel's Inspiration Center in Düsseldorf. (see references: adhäsion_66_22 and adhesion_19_22)

The automation of laboratory processes not only significantly enhances throughput, thereby reducing time to market, but it also affords highly qualified employees more time to engage in value-added activities, such as experimental planning and the research of innovative products.
Automation provides the additional advantage of ensuring maximum reproducibility and minimizing human errors, which is particularly important for QC. Due to the automatic documentation of all data and measurement results, the data structure of automated processes is excellent. The evaluation and utilization of such high-quality data through artificial intelligence is a promising avenue for future developments.

Automation X

Ewald Harrer

AUTOMATION AND DIGITALIZATION, TRANSFORMATION TO CONSISTENT, EASILY CONTROLLABLE AND EFFICIENT PRODUCTION

Abstract
Integrated manufacturing processes from input/output level up to the business system within one platform and from raw material sourcing, including the production process up to final goods shipped to customer….. Wishful thinking and steps towards reality.
Market, resources, quality and other requirements force us for actions, but where to start and what investments are necessary?
Proven examples and results from industrial customers as well as future outlook (optimization of complex processes and use digital twin technologies).

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fitech

Patrick Thoma

DIGITALISATION IN BATCH PRODUCTION

Abstract
Digitalisation in batch production is understood in the sense of using digital data to improve procedures and processes. Digital technologies in production also have an impact on purchasing, sales and customer service. Digitalisation therefore not only offers an important opportunity for employees, but also for customers and suppliers.

By linking machines, electronics and software, production works according to defined processes and quality becomes more consistent. Production lines can be optimised and plant management improved. At the same time, flexibility is increased and energy consumption is reduced.

Examples will give you an insight into practical implementation. The automation capability of the production plant and its machinery plays an important role here.

KLEBTECHNIK Dr. Hartwig Lohse

Dr. Hartwig Lohse

QUALITY RELEVANT CONSIDERATIONS WHEN PROCESSING 2C ADHESIVES FROM CARTRIDGES

Abstract
Even though the use of 2C adhesives from cartridges is considered foolproof on the first glance, there are a few details to be considered in order to avoid or detect errors and to achieve a high-quality bond in the end.

The presentation is addressed to manufacturers and suppliers of adhesives filled in 2C cartridges as well as to the users of such adhesives. The interaction between the respective adhesive, the double-chamber cartridge, the different technologies of available static mixer, the dispensing device and, last but not least, the parameters of the bonding process will be covered.

LUM GmbH
Stefan Küchler* Uwe Rietz, Dr. Arnold Uhl

NEW FRONTIERS IN STABILITY ANALYSIS OF COMPLEX FILLED ADHESIVES WITH STEP- & CAT-TECHNOLOGY®

Abstract:
Modern adhesives and sealants are applied in consumer electronics, e-mobility and many other High-Tec products. They are complex formulations, designed to match highest requirements in performance, handling, usability and costs. The spectrum of parameters to meet manufacturer and end user specifications results in time consuming and costly testing methods.
Dispersion stability and mechanical stability are two essential figures, closely linked for adhesives. A careful selection of fast, precise and innovative testing method for them - chosen by the developers - is the key to defend or reach the pole position in the market.
In the field of adhesives, highly filled formulations bear special challenges for the dispersion stability analysis. Typically, classical methods are either too time consuming or does not allow to provide a look inside the adhesives and sealants. This is due to high opacity (i.e., when carbon black is incorporated), high viscosity, high solid concentration or combinations thereof. Here the combination of STEP-Technology® based LUM instruments provides new insides and testing solutions – especially if they contain carbon black or nano particles.
On a number of examples, it will be demonstrated, how the combined use of STEP-Technology® instruments provides new insides into the dispersibility and dispersion stability of these complex formulations in a much shorter time and with unmatched resolution. In addition, we introduce the CAT-Technology® as a quick and reliable tool to investigate the mechanical stability of the newly designed adhesives.
The combination of both technologies reduces the development time of new adhesives and sealants significantly without compromises regarding reliability and development time.

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USING LOW MELTING ALLOYS TO SEPARATE ADHESIVELY BONDED JOINTS FOR REPAIR AND RECYCLING

Abstract:
The circular economy is a concept of production and consumption in which existing materials and products are shared, leased, reused, repaired, refurbished and recycled for as long as possible. Concerning adhesively bonded joints the main task is to provide a separating mechanism, which is easy to separate and at the same time ensures a reliable bond throughout the whole lifetime.
We describe a new approach on how Low Melting Alloys (LMAs) are used as separation layers in bond lines, thus providing a thermally activated separation only determined by the melting temperature of the LMA. The LMAs are either used as a coating on the adherends, or as a foil/film embedded in the bond line (interlayer), thus not limiting the user to specially formulated adhesives or hot melts. Furthermore, the separation uses a nondestructive approach, assuring the same mechanical properties as before the separation.
Concerning the separation layers different materials and production processes are tested. LMA interlayers and coatings are made of either a Bismuth-Indium eutectic (BiIn), a Bismuth-Tin-Silver alloy (BiSnAg) or pure Tin (Sn). The interlayers can be separated in two main groups, firstly foils made by use of roller, heating press or doctor blade unit and secondly physical vapor deposition (PVD) interlayers on a backing film of polyethylene terephthalate (PET) or polyimide (PI). The

interlayers and coatings are analyzed by X-ray fluorescence (XRF) or Energy-dispersive X-ray spectroscopy (EDX), to assure the same composition as the raw material, therefore providing the same melting characteristics. Grain structure, homogeneity, closeness and surface roughness are analyzed using optical microscopy and scanning electron microscope (SEM). Durability of the bond line is tested by use of salt spray test and water immersion on lap shear specmens. To assure the main feature separation tests are performed using conduction, radiation, convective flow and electromagnetic induction to apply heat.
The separating layers can be implemented in inline, as well as in single unit production, providing a safe and easy way of separating components.

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