

Adhesives – the talk of the town today and tomorrow

Forty years after Prof Dr Knut Nitzl initiated the first MKVS (Munich Adhesives and Finishing Symposium) in 1976 and ten years since the current organizers, Stephan Hinterwaldner and Dr Michael Gerstenberger of MKVS GbR, took the helm – the 40th MKVS programme marked both anniversaries at once. From October 26-28, 2015, once again 250 or so developers, technical specialists from the industry and academia coming from almost 20 countries converged to discuss what is new and newsworthy in pressure sensitive adhesives with a focus on dispersions, solvent borne products, reactive systems and HMPSA in English and German – as well as to make use of the industry reunion to float new ideas, discuss the food for thought presented or simply touch base. As in the previous years, the symposium was topped off with a table top exhibition, providing a more in depth insight and the opportunity to discuss some of the expertise expressed in the papers given. Arizona Chemicals, Cabot, DKSJ, Emerell, ITW Dynatec, Keyser & Mackay, Michelman, Nordman Rassman, TER Group and ViscoTec participated in this exhibition.



The plenary speech on development, economic importance, growth factors and markets with a specific focus on PSA by Ansgar van Halteren from the German adhesives association, Industrieverband Klebstoffe e.V., kicked-off the symposium. Franky Dauw from ExxonMobil Chemical, continued in this vein by showing how the HM(PS)A industry can meet future needs. These papers paved the way for further more in depth discussions of the chemistry and technology involved in innovative and niche markets such as printed electronics and cash cows such as packaging.

«Dragging» adhesives from the ivory tower of pure research, technology and theory, Bernd Jablonowski from Messe Düsseldorf brought a real-world tone to the table: presenting the initiative

«save food», he showed how using the right packaging – that this also includes the right adhesive goes without saying – can save or better the lives of millions. The 20 minutes allotted to each oral presentation hardly seemed enough time to touch all aspects of the goals the technology, chemistry and research presented in the following 25 papers are meant to reach.

Chaired by Evert Smit from Lohman, the remaining first day featured two different ways in which nature can influence adhesives and specific approaches to applying them and the pitfalls to evade in doing so. Resources common in nature and therefore easily reproducible, such as yeast, sugar or bacteria, provide the basis for the higher alcohols and ketones, Dr Andreas Menne from Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT explained. The intermediates usable as e.g. solvents and derivatives usable as e.g. plasticisers are the products a special catalytic coupling process developed by UMSICHT can generate from these renewable resources. However, adhesive properties common in nature can also inspire innovative properties engineered in adhesives. For example arachnids inspire the glue for otherwise anti-adhesive surfaces introduced by Jonas O. Wolff from the Department of Functional Morphology and Biomechanics at the University of Kiel. This development is still at the outset. Time to market is estimated at around 15 years.

With hot melts being the adhesive of choice where energy needs to be saved and environmental aspects play a role, the application process, too, needs to be examined according to economic criteria. For example, when hotmelt-PSA are applied by smooth rollers in different set-ups, as shown by Marco Schubert from Kroenert, the results of the application process such as even and appealing coating are affected by physical aspects of such as viscosity and temperature. Mirko Rinco from Bobst Italia introduced the pros and cons of an alternative application method: using slot dies for hot melt coating. However, the best application system will fail, where hot melt enemy number 1 strikes: char. Guido Schürmann from ITW Dynatec showed how easy it is to ban this enemy from the production site: when softening point and temperature versus viscosity curve of the adhesive are known, so that the lowest possible temperature for the process can be regulated and pain is taken that no fillers and packaging residues contaminate the adhesive, the appropriate system (melter and application head) can be chosen. Hoses transporting the hot melt should be installed permanently. Hoses and application heads should have the dimensions suited to the process. If on top optimal cleaning and maintenance cycles are maintained, there is no reason why char should not be history.

Where adhesion in composite materials involving PSA is a problem, this can be remedied by surface treatment using the plasma tools for surface activation in reel-to-reel PSA applications introduced by Josu H. Roig Leibrandt from Relyon Plasma: a series or matrix of single plasma jets, rotation nozzles and slot nozzles. «The range of topics spanning from a currently very promising future topic, printed electronics, and the various concepts for raw materials for and production of new adhesives, to basic research of cross linking reactions and migration of mineral oil derivatives coming from adhesives. All in all, every paper showed an interesting and exciting perspective of the future of adhesives.» Dr Peter Barth, Creative Network Consulting, chair of the second day summed up the papers given.



One requirement of modern adhesives is that they can do so much more than just join two substrates. Given a functionality, such as electrical conductivity, they can be the base for hybrid products merging printed electronics and silicon electronics. Wolfgang Mildner from MSWtech showed that many exciting applications of this technology could be possible once specific requirements have been addressed and further research has taken place. A barrier against water vapour is the functionality addressed by Ferdinand Ruess from the Fraunhofer Institute for Process Engineering and Packaging IVV. Additives containing active water vapour absorbing nanoparticles can achieve this. His research for OLED packaging with high barrier film shows that the barrier properties are not only effected by the thickness of the active layer and the mass amount of nanoparticles in the adhesive, but also by the location of the active layer in the barrier stack and by the number of barrier layers. Also, the functional adhesive requires further development regarding both cohesion and adhesion in the film composite.

Where adhesives need to be sticky in a humid environment, as is, for example, the case in the construction industry, Dr Anke Lewin from Evonik Nutrition & Care revealed that silane-modified polymers with lateral crosslinking groups, so-called «NEW-SPs» that react with humidity can be a game changer. They are also an interesting class of raw material for PSAs curable after application in the presence of humidity and they offer new possibilities for adhesive formulation developments to react to growing or changing market requirements.

Crosslinking is, according to Prof Dr Zbigniew Czech from West Pomeranian University of Technology Szczecin, a recurrent theme

in many PSAs applications, as it influences the bulk properties of the adhesive film and builds shear, heat and chemical resistance, while negatively impacting tack and peel. One example for a crosslinking agent are UV crosslinkable materials. They have grown tremendously over the past. As Jan Scheffel from Biolink explained, using UV-LED on certain formulations in PSA-Production can lead to certain properties in adhesives.

Adhesives may also have certain undesired side effects. Molecules from their formulation can migrate into the packaged foodstuffs and at best only change smell and taste, at worst be detrimental to the health of the person ingesting the contaminated food. Migrating mineral oil residues are an example of the latter. With the packaging substrates in food packaging now being available with effective barrier coatings against these molecules, Martin Lommatzsch, PhD student of TU Dresden, Chair of Food Science and Food Contact Materials, took the topic one step further. In cooperation with the GC Department of Kantonales Labor Zurich, Switzerland, he researched the migration potential of hydrocarbon resins used as tackifiers in HMA and (HM)PSA. His findings were that there had been a contamination of the foodstuff researched with oligomers from the adhesives used in the packaging. However, they also showed that both analysis and interpretation of the results obtained are difficult, more especially as there is no sufficient information available to the toxicity of the migrated substances. When the migrating molecules change the odour of the packaged foodstuff, this is the result of polymerization, degradation of raw materials and the additives used in the hot melt adhesive. According to Dr Thomas Hopfmann from Addivant, the most powerful and versatile choice is to use an appropriate low odour antioxidant package. However, as Prof Dr Dirk Burth from Munich University of Applied Sciences shows, diffusion of certain molecules can also have an effect on other adhesive properties. His research of raw materials regarding diffusion, permeation, and solubility of single raw materials in PSAs put the PSAs behaviour in a new perspective. Furthermore, two other raw materials used in formulating adhesives were presented: lactide based co-polymer technology providing excellent stability and processability and improved adhesion introduced by Chris Schaekens from Corbion Purac Biochem, and so-called cabot particles presented by Elizabeth Sims from Cabot Corporation. Cabot particles are a pour-in means of introducing fumed silica particles into waterborne pressure sensitive adhesives. Formulation time can be shortened by this technology, as the step of first creating a silica dispersion from the dry powder falls away. This method also increases processability and performance because the distribution of silica remains constant throughout processing, as well as during drying and coalescence of the adhesive film. This can result in significant improvements in cohesive shear strength and thermo-mechanical properties of water borne pressure sensitive adhesives. Dr Anja Schneider from Henkel provided another approach to sustainability: a new technology approach to higher total solid solvents. Broader formulating capabilities with 10 - 15 % higher solid systems than conventional solvent PSAs and coatable viscosity improve coater efficiency.

«The third day of the 40. Munich Adhesives & Finishing Symposium was especially dedicated to contributions having to do with tape masking and mounting applications. Furthermore, the focus

was put on the use of innovative silicone polymers in both fields, as high performing PSAs as well as in the release materials field – what always stimulated questions from the audience.» Stephan Hinterwaldner from MKVS GbR, the event's co-organizer and chair of the last day, sums up the papers given. Asked about the trends he noted in the papers given, he especially referred to «Dr L. Berger of Sekisui Alveo with his contribution „Polyolefin Foams for the Pressure Sensitive Tapes – State of the Art and Outlook». And explained further: «He demonstrated in which way modification of the foam surface might improve production process, quality and reliability of foam tapes. The trend is also here, that through a close cooperation of end user, tape, adhesive and foam manufacturer doors open for even further new applications.» Of course the event was also a moment to show and tell about innovations. For Mr Hinterwaldner «Noteworthy new developments were presented e.g. by Lohmann with their functional adhesive tapes for local anodization of aluminum avoiding the classical bath

process and by Dymax with their SpeedMask®, a light curing solvent free one component system for applications on geometrically complex surfaces.»

Next year, at the 41st Munich Adhesives and Finishing Symposium 2016, hot melts, hot melt PSAs and extrudable films with a special focus on base materials, converting and applications will take centre stage at the Conference Centre of the Sheraton Arabellapark Hotel in Munich, Germany, from October 17-19, 2016. The call for papers is on-going until April 30, 2016, by when title and abstract (max. one printed page in English and/or German) of the respective innovative technical paper need to be submitted. Parties will be notified that their paper was accepted by May 08, 2016 and the full paper to be included in the proceedings is requested by August 31, 2016, in English and/or German.