SPES CLASSIFICATION OF VINYL GLUES

INTRODUCTION

The vinyl glue is one of the most used adhesives with several brands and manufacturers on the market. The most commonly used vinyl synthetic resin is polyvinyl acetate (PVAc) in an aqueous emulsion, which has a variety of use in industries, in art and hobby, in handcrafted works and in book-binding, due to its flexible strong bond and non-acidic nature (typically without need for primers). The vinyl glue looks like a white milky liquid. The advantages are low price and toxicity, simple use, and good sticking efficiency.

In this application note, the classification of two commercial aqueous vinyl glues via EOS Classizer™ ONE and liquid sample manager EOS LMS01™ is presented.

PARTICLE ANALYSIS METHOD

EOS Classizer™ ONE is based on the patented Single Particle Extinction and Scattering (SPES) method. It introduces a step forward in the way the light scattering is exploited for the characterization of particle mixes through the classification of each single particle optical properties.

EOS Classizer™ ONE particle analyzer equipped with EOS standard liquid sample manager LMS01™ - front view

Classizer™ ONE retrieves the particle size distribution, concentrations, oversize, optical structure, and other unique insights of each particle population detected in a liquid. Classizer™ ONE works offline and online/real-time, enabling to verify the consistency of the intermediate and final formulations with target QbD, SbD expectations.

For a general introduction to SPES and EOS Classizer™ ONE, please refer to the Application Note AN001/2021, available online along with other application notes and examples at: www.eosinstruments.com/publications/

APPLICATION EXAMPLES

EOS Classizer™ ONE is exploited to characterize two commercial vinyl glues. A small aliquot of each vinyl glues is diluted in filtered milliQ water and measured at 5ccm for about few minutes. Tens of thousands of particles are measured for each sample resulting in a suitable statistic for the data interpretations covered by this study.

The two glues present both a single "relatively" monodisperse particle population but located in two different positions in the EOS CLOUDS histogram (Figure 1). This measurable difference in the optical properties suggests a difference in the formulations of the two commercial glues (material, particle structure).

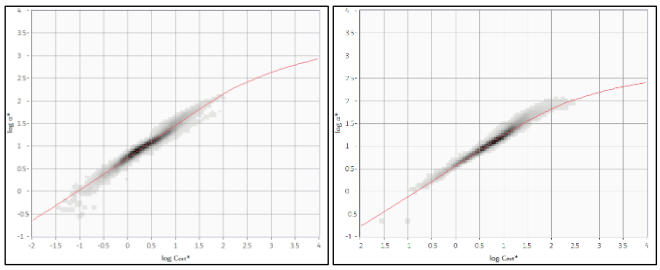

Figure 1 EOS CLOUDS of the two measured commercial vinyl glues. The experimental data shows that the products are mainly composed by a single population of particles. The populations of the two samples have different effective refractive index. The particle population of the first commercial glue (left) is compatible to an effective refractive index of 1.40. The particle population of the second commercial glue (right) is compatible to an effective refractive index of 1.48.

Benefiting from the SPES calibration-free information on the optical properties, it is possible to determine with high accuracy the numerical size distributions of the two populations of particles (Figure 2, Figure 3). It is noted that the two numerical dimensional distributions are similar although their different effective refractive indexes.

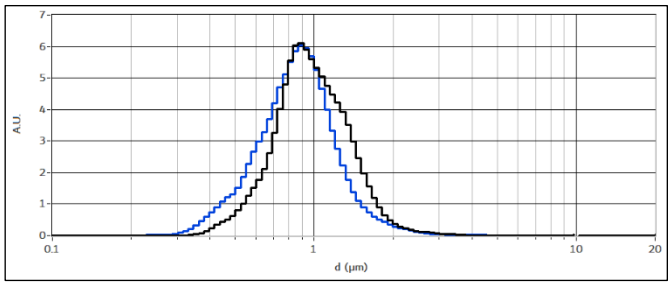

Figure 2 Numerical PSD of the two commercial vinyl glues.

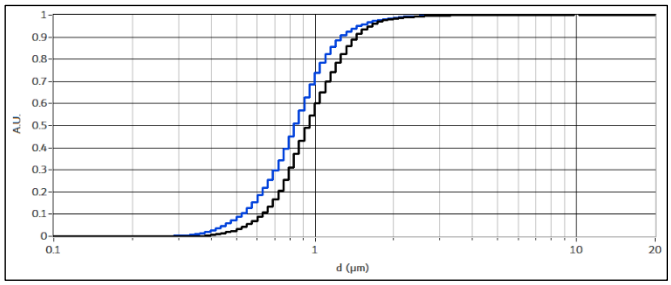

Figure 3 Cumulative PSD of the two commercial vinyl glues.

CONCLUSIONS

The capability of EOS Classizer™ ONE and SPES patented method fits the need of a value-added application in the characterization of vinyl glues. SPES data provide physical and statistical information, as PSD and oversize. Each characteristic can be crucial to improve the knowledge and the quality of the formulation.

RELEVANT PUBLICATIONS AND REFERENCES

Presentation of Single Particle Extinction and Scattering (SPES) method for particle analysis
AN001-2021 Analysis of Polymeric Particle Mixes via SPES Technology – an introduction to SPES method

AN006-2021 Multiparametric Classification of Particles as a Pathway to Oversize Analysis in Complex Fluids via SPES Technology

Potenza MAC *et al.*, «Measuring the complex field scattered by single submicron particles », AIP Advances 5 (2015)

Example of CFA application of SPES technology
AN002-2021 Continuous SPES Flow Analysis CFA-SPES

Example of PCA application of SPES technology
AN005-2022 Batch-To-Batch Consistency Via Multiparametric SPES Principal Component Analysis PCA

Classizer™ ONE + Sample Managers & Autosampler
AN008-2022 Automatic Liquid Sample Management and System Cleaning with EOS LMS01™ and LMA01™

AN009-2022 Standardize SPES Operative Procedure and improve throughput of Liquid Samples via EOS LAS01™

Example of SPES application to aggregates
AN003-2021 Addressing the Issue of Wetting and Clustering by Means of SPES Technology

Potenza MAC *et al.*, «Single-Particle Extinction and Scattering Method …», ACS Earth Space Chem 15 (2017)

SPES application to non-spherical particles
AN004-2021 Addressing the Classification of Non Spherical Particles by Mean of the SPES Technology

Simonsen MF *et al.*, «Particle shape accounts for instrumental discrepancy in ice …», Clim. Past 14 (2018)

Example of SPES application to emulsions w/o payload in environmental waters
AN012-2021 Monitoring the Fate of a Lipid/ZnO Emulsion in Environmental Waters

AN015-2022 Classification of Oil and Oil Mixes Emulsions via SPES Technology

Examples of SPES application to particle analysis and behavior characterization in biotech applications
AN011-2021 Quantitative Classification of Particles in Biological Liquids via SPES Technology

AN016-2021 Multiparametric Determination of Yeast Cell Viability via SPES Technology

Sanvito T *et al.*, «Single particle extinction and scattering optical method unveils in real…", Nanomedicine 13 (2017)

Examples of SPES application to inks and pigments
AN018-2022 Classification of Inks and Pigments via SPES Technology

Example of SPES application to oxide particles, abrasives, and industrial slurries w/o impurities
Potenza MAC *et al.*, «Optical characterization of particles for industries», KONA Powder and Particle 33 (2016)

AN013-2022 Analysis of Abrasives via SPES Technology

Example of SPES application to ecotoxicity analysis
Maiorana S *et al.*, «Phytotoxicity of wear debris from traditional and innovative brake pads», Env Int., 123 (2019)

Example of SPES application to aerosol analysis
Cremonesi L *et al.*, «Multiparametric optical characterization of airborne dust …. », Env Int 123 (2019)

AN010-2023 Multiparametric Optical Characterization of Airborne Particles via Patented SPES/SPES² Technologies

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