



The NEXT STEP™ in Dispersion Analysis  
& Materials Testing



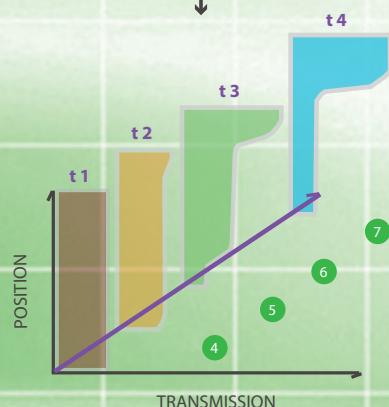
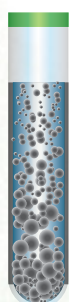
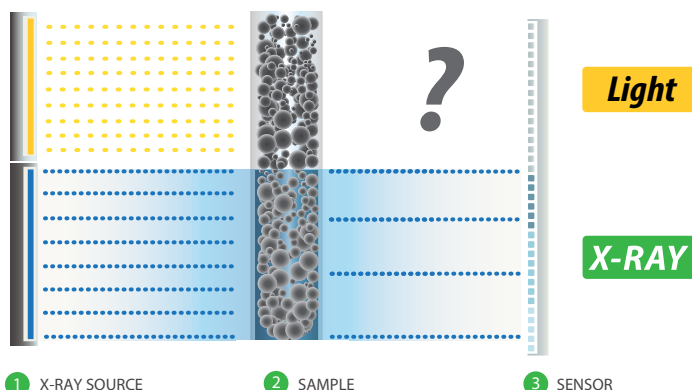
# LUMiReader®

## X-RAY

**- illuminating even the most concentrated  
emulsions & suspensions**

Phase separation | Stability | Sediment consolidation

# LUMiReader® X-Ray using



- 1 X-RAY SOURCE
- 2 SAMPLE
- 3 SENSOR
- 4 5 6 7 KINETICS OF TRANSMISSION

The LUMiReader® X-Ray is the first dispersion analyser designed for one purpose only: to study dispersability, stability, separation, and consolidation phenomena for completely transparent to completely opaque emulsions or suspensions. For the first time ever, illuminate your sample instantaneously from top to bottom. Solve your most challenging dispersion problems with complete insight. Go places light cannot.

Our patented solution combines x-ray vision with the proven STEP-Technology®, permitting highest spatial resolution, short sampling intervals and powerful detection technique. The LUMiReader® X-Ray creates monochrome and parallel x-rays <sup>1</sup> with the help of a special crystal, which transmits the entire sample cell <sup>2</sup> of 20 mm height. More than 1600 detectors record the transmitted beam, giving an unprecedented resolution <sup>3</sup>. Instantaneous transmission profiles across your whole sample are converted into stability and separation rates. Particle concentration, sediment packing density can also be calculated based on the extinction profiles.

The obtained Space- and Time-resolved Extinction Profiles allow you to measure and understand particle stability, phase separation, and sediment consolidation in systems that where up to now, unknown frontiers of science and technology <sup>4-7</sup>.

The LUMiReader® X-Ray allows you to optimize your formulation, measure its stability, and perform accurate shelf life tests, regardless of the shape or concentration of your dispersed particles and droplets. In-situ, real-time, non-invasive and non-destructive.

Typical applications are cosmetics, pharmaceuticals, paint & pigments, construction materials and fillers, as well as mining, ceramics and petrol industry dealing with complex emulsions, slurries and sludges.



# SEPView®



your window to dispersion analysis

- ▶ Windows 7/8 based with Ribbon User Interface
- ▶ Plug & play, pack & go
- ▶ Individual user customization
- ▶ Full SOP concept (Creation, capture, data analysis)
- ▶ 8 different tools to understand (quantify) even the most complicated dispersion:

Time lapse measurement replay

Dispersion fingerprint

Instability index

Clarification

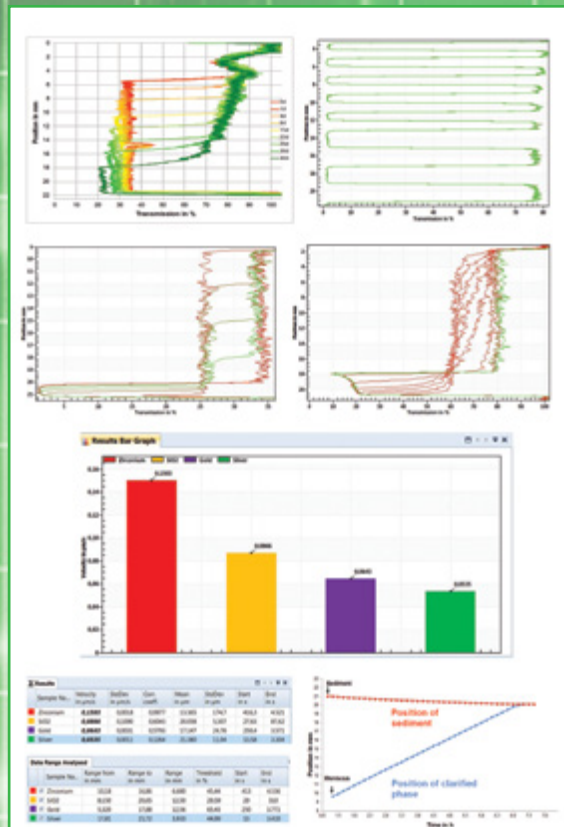
Phase separation

Sedimentation and creaming velocities

First derivative of integral transmission

Linear X-ray attenuation coefficient

- ▶ Analysis templates
- ▶ Zoom in and out of any area of interest
- ▶ Comparison of old and new measurements
- ▶ Comprehensive database security and full audit log
- ▶ Complies with 21 CFR Part 11



## Safety features

What we have done for your safety

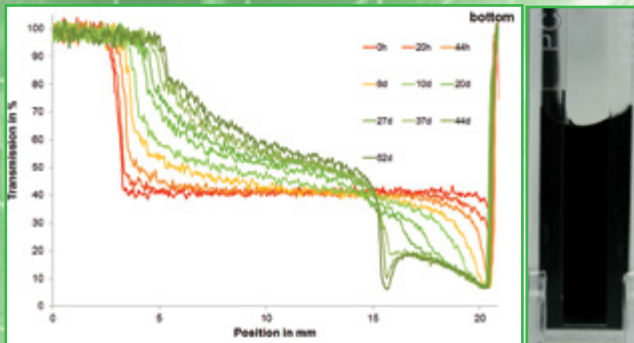
A full protection security circle certified by PTB – the national metrology institute providing scientific and technical services and Federal Office for Radiation Protection (BfS) protects the user. So anyone can employ the instrument free of risk and without worries about the x-ray radiation. No specific training course about x-ray instrumentation, nor any special operation licenses are required by the user.

A thick lead layer shields the environment from the x-ray exposure inside the apparatus. Because of this and various other safety designs, there is no detectable energy dose outside the instrument. State of the art interlocks sentinelling the sample lid position and the x-ray tube shutter action. Opening the lid during a measurement causes an immediate shut down of the shutter and the x-ray source, triggered by the sentinel circuit independent from software and user.

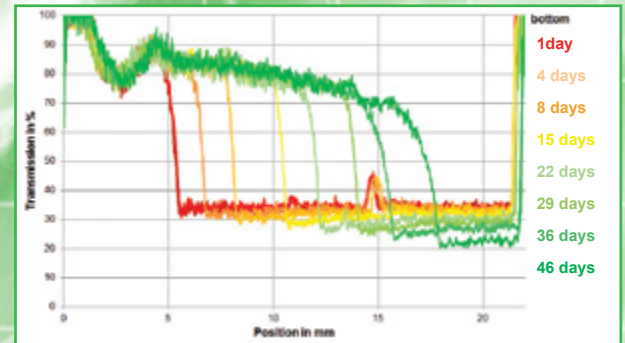


# Applications & Samples

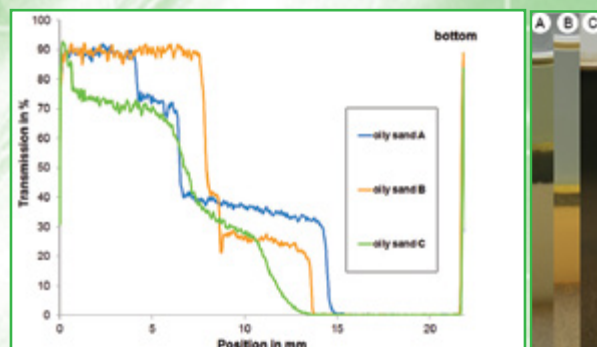
Phase separation of  $\text{MoS}_2$ -Graphit suspension



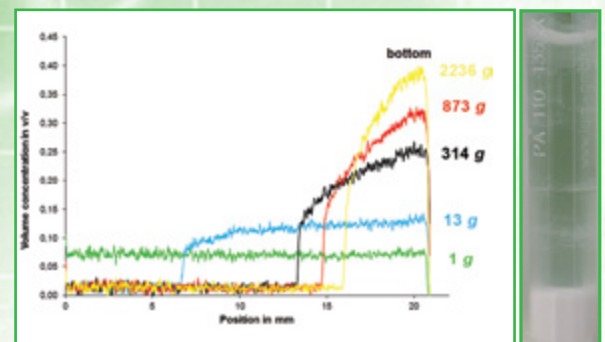
Phase and sediment formation of polymer dispersion



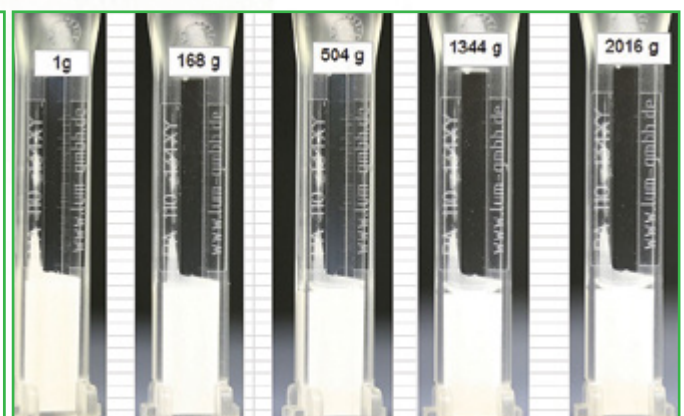
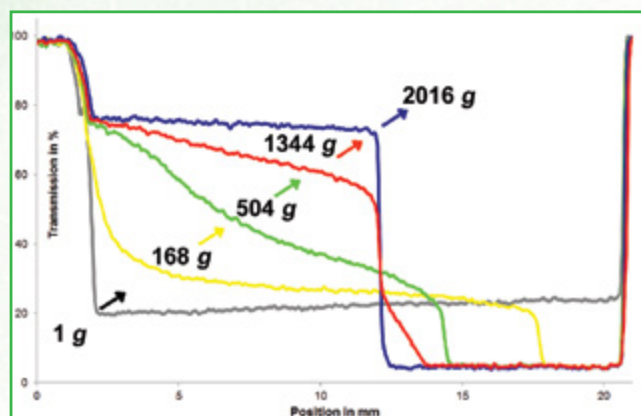
Visual appearance and x-ray intensity profiles of oil sands after separation



Packing density gradients of lime after centrifugal consolidation



X-ray phase detection of ongoing clarification and sediment growth (left) within even opaque systems (right)





# Benefits

extremely  
high  
concentrations

- ▶ In-situ analysis of transparent as well as opaque dispersions
- ▶ No dilution of emulsions or suspensions
- ▶ Signal does not depend on particle shape
- ▶ See/understand complex dispersion behaviour
- ▶ Study the various instability mechanisms
- ▶ High resolution of phase separation of multicomponent systems
- ▶ Detect concentration gradients within phases and sediment
- ▶ Determine mean and space resolved packing sediment densities
- ▶ Endless monitoring of sample behaviour for long-time storage information
- ▶ Use any continuous phase of dispersing agent
- ▶ Real time, non-invasive and non destructive
- ▶ High-end analyser for QC, process monitoring and R & D



# Application Areas

Abrasives  
Batteries  
Carbon black  
Catalysts  
Coated particles  
Cosmetics  
Ceramics  
Construction materials  
Lubricants  
Magnetic particles

Microemulsions  
Metals  
Mineral powders  
Nanosuspensions  
Oil sands  
Paints  
Pigments  
Rigid foams  
Silicone emulsions  
Solid electrolytes



# Specifications

|                                  |   |
|----------------------------------|---|
| <b>Measurement principle</b>     | Monoenergetic X-ray attenuation                       |
| <b>Phase separation</b>          | High concentrated dispersions (transparent or opaque) |
| <b>In situ sediment analysis</b> | Packing density & structure                           |
| <b>Stability analysis</b>        | From seconds to days or weeks                         |
| <b>Consolidation measurement</b> | Also in combination with LUMiFuge & LUMiSizer         |
| <b>Conformity</b>                | ISO/TR 13097; ISO/TR 18811; CFR 21 Part 11            |

|                      |   |
|----------------------|---|
| <b>Samples</b>       | Suspensions, Emulsions, Suspo-Emulsions, Sludges, Slurries, Foams & Powders |
| <b>Channels</b>      | 1 sample  |
| <b>Volume</b>        | 0.3 ml to 1.6 ml  |
| <b>Concentration</b> | Up to 100 Vol%  |
| <b>Particle</b>      | any shape, from nano to microscale, no density restriction                  |

|                                       |  |
|---------------------------------------|--|
| <b>Source</b>                         | Monoenergetic X-ray, 17.48 keV, max 20 W at 40 kV, air cooled              |
| <b>Monochromator</b>                  | Graphite   |
| <b>Disturbance free</b>               | No moving parts  |
| <b>Dimensions (WxHxD), Weight</b>     | 47 x 24 x 44 cm, 25 kg   |
| <b>Power supply</b>                   | 24 V, 220 W, Adapter (100 V to 240 V) included                             |
| <b>Safety</b>                         | Fully radiation protected system;<br>Radiation < 1 µSv/h (BfS 03/13 V RöV) |
| <b>Radiation control requirements</b> | None; instrument can be used anywhere                                      |

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