Introducing the

*M*ageleka *M*agno*M*eter™ XRS

A New Instrument for Particle Characterization and Surface Analysis of Suspensions and Slurries

What is a *Ma*gno*Me*ter?

- A device that uses NMR relaxation for non-invasive routine analysis of complex solid-liquid and liquid-liquid formulations
  - Samples in water, solvents and melts
  - No dilution required, minimal sample preparation

- Ideal for applications where speed of measurement and reliability are drivers of performance
  - Research & development
  - Quality control/quality assurance
  - Process control labs

What is NMR relaxation?

- NMR relaxation time is a fundamental, intrinsic property of all solids and liquids
  - Analogous to intensity of scattered light (particle sizing) and electrophoretic mobility (zeta potential)
- NMR relaxation measures how protons react, through their molecular motion, in a magnetic field
- Relaxation time of suspensions/slurries is intermediate between that for solid and liquid
  - Value depends on specific particle-liquid combination
  - Determined directly using an NMR spectrometer

Why use NMR relaxation?

"In every industrial application, a knowledge and understanding of the molecular structure and dynamics at the particle-liquid interface is critical to improving, or optimizing, suspension and emulsion product performance."

NMR Instruments

High resolution NMR
well-known technique for studying molecular structure and identification of compounds

- high frequency needed
- expensive, complex, sophisticated operation
  - intensive training
- university and analytical laboratories

Low field NMR
new technique for suspension and emulsion analysis

- low frequency optimal
- inexpensive, simple benchtop device
  - easy operation
- industrial R&D, QC/QA and process laboratories

What can you measure?

- Dispersed (wetted) Surface Area of suspensions
- Dispersed particle volume fraction
- Molecular weight (polymers in solution)*
- Polymer and solvent viscosity
- Particle Size (<30nm)
- Relaxation Number (liquids/suspensions/emulsions)
  - Kinetic processes
    - Adsorption/desorption
    - Competitive adsorption
    - Colloidal stability
- Presence of para- and ferro-magnetic impurities
- Hydroxyl (OH) number of metal oxides
- Oxygen and water content of solvents

* By calibration

Applications

“The MagnoMeter can be used in an almost unlimited range of applications, and can measure samples at virtually any industrially relevant solids concentration.”

- Graphene/Graphene Oxide
- Cellulose nanocrystals
- Ceramics, refractories
- Minerals, metal oxides
- Paints and inks
- Dyes
- Pharmaceutics
- Nanomedicine
- Cosmetics
- Food emulsions
- Agrochemicals
- Catalysts
- Paper pulp
- MOFs

Summary

What does the *M*agno*M*eter provide?

- Direct information about the extent and nature of *any* particle-liquid interface → suspensions and emulsions
  - any type of particle, and any liquid – including mixtures
  - exceptionally wide concentration (0.01% to 90+%)
  - no dilution required, minimal sample preparation
  - small samples (typically 0.1mL; as little as 200µL)
- Complementary information to traditional particle characterization techniques
- Intelligence that is not possible with traditional techniques

Summary

Advantages of the *M*agno*M*eter

General

- Any colloidal-size suspension – virtually all liquids
- Measure locally with data manipulation at remote terminal
  - Ideal for controlled or hazardous environments
- Multiple pod sensors facilitate sampling at different locations
- Frequency lock
- Measure mixture homogeneity

Options and Extensions

- Large diameter NMR tube
  - viscous liquids, concentrated slurries/emulsions
- MRI methods (imaging) in specific samples
- Can be adapted for use with an auto-sampler
  - multiple sample analysis
- Can be adapted for flow-through operation

In Conclusion

The *Magno*Meter finds use from Fundamentals to End-Use Performance

- *Research & Development*
  - Basic formulation of products: reproducibility, stability (coagulation/flocculation), settling and sedimentation, shelf life
- *Quality Control*
  - Release of raw materials, batch-to-batch reproducibility of final product
- *Quality Assurance*
  - Enable release of complex systems which can currently only be characterized by the raw materials used rather than the manufactured product
- *Process Management*
  - Follow and monitor milling and manufacture processes in almost real-time

Thank you!

For more information, to send samples, to arrange a demonstration at your facility, or to speak to a technical applications specialist, please contact:

info@mageleka.com
+1 617 331 1130
www.mageleka.com