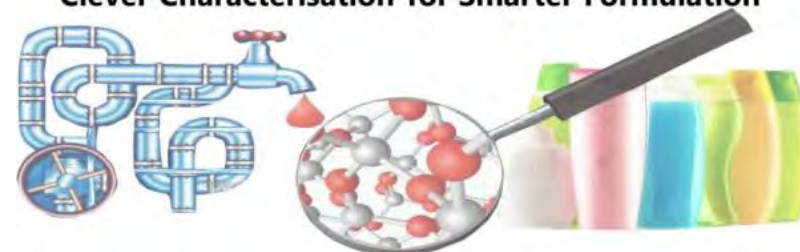# Sanderson TECHNOLOGY

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Royal Society of Chemistry
Burlington House, London
10th November 2017

Formulation
Science & Technology
Group

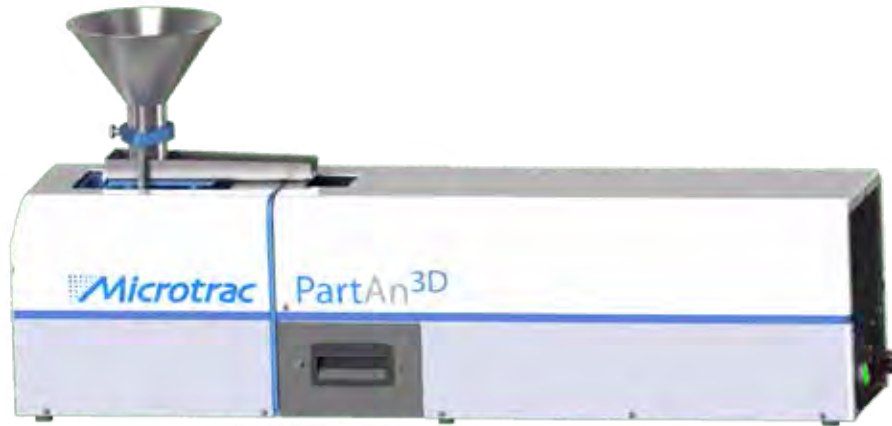Clever Characterisation for Smarter Formulation

Microtrac
Image Analysis
Particle Size and Shape PartAn SI

Mageleka
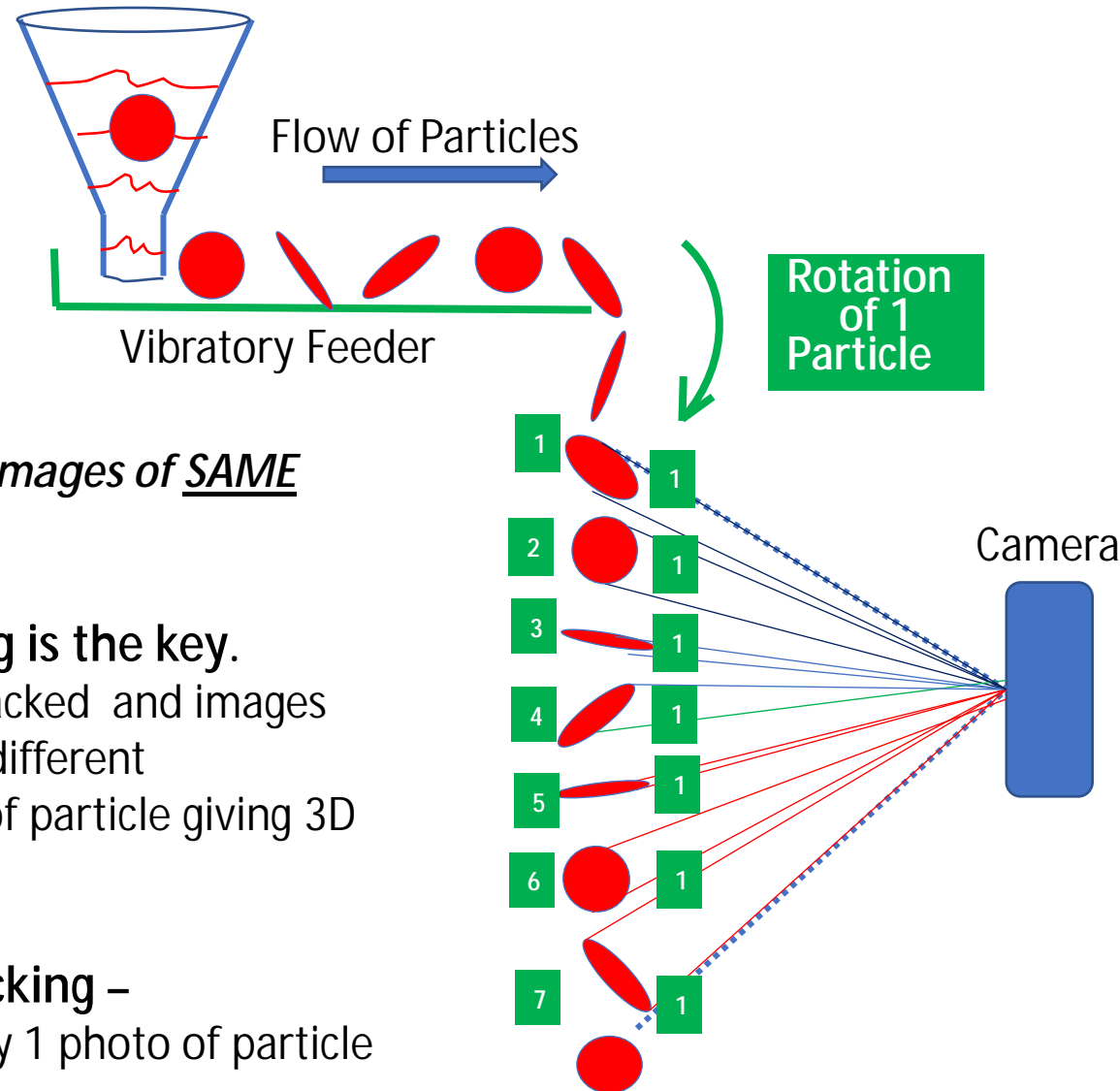## Proton NMR measurements of dispersions

Size Range 5µm to 1500µm

Size Range 4µm to 3500µm

On Line

Size Range 280µm to 127,000µm

Microtrac Innovation: Patented 3D measurement technique

Flow of Particles

Vibratory Feeder

Rotation of 1 Particle

3D *Multiple images of* **SAME** *Particle.*

3D - Tracking is the key.
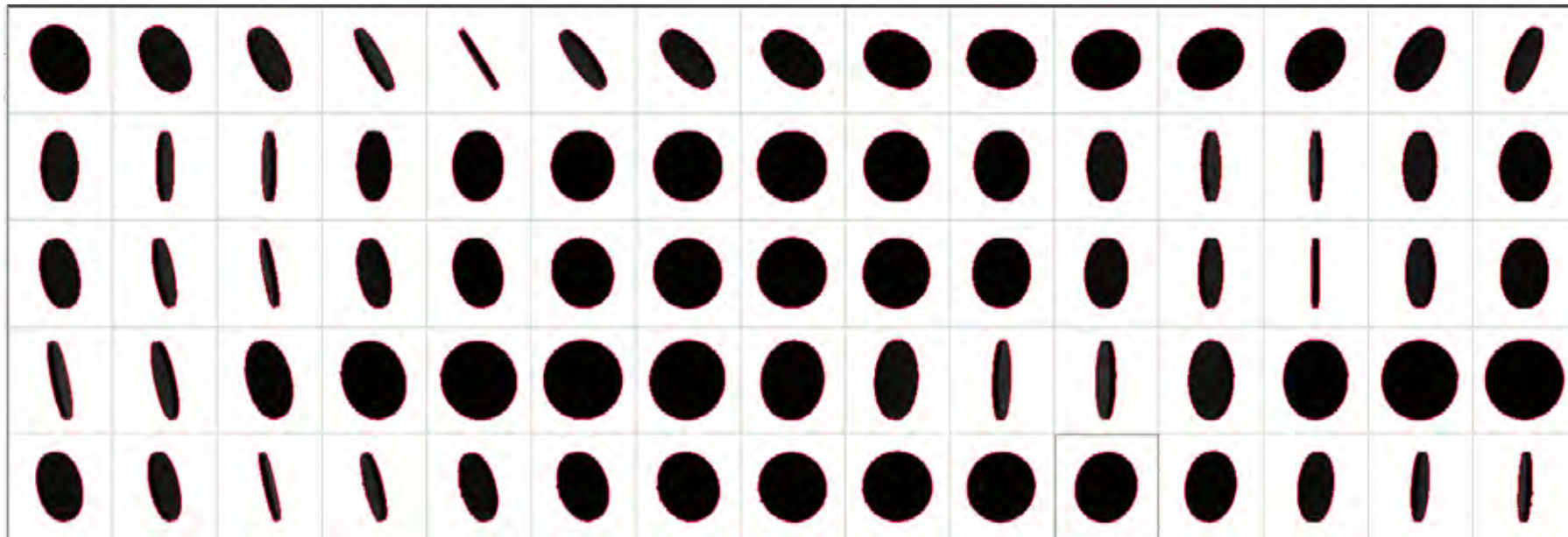Location is tracked and images obtained for different orientations of particle giving 3D information

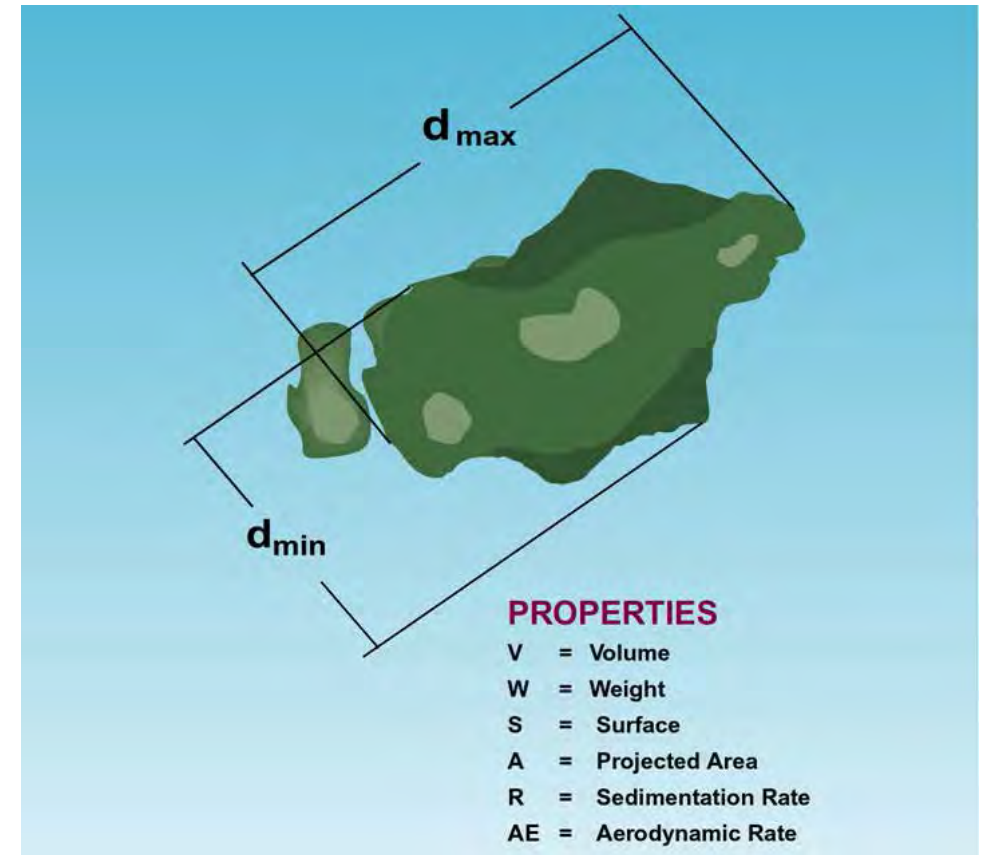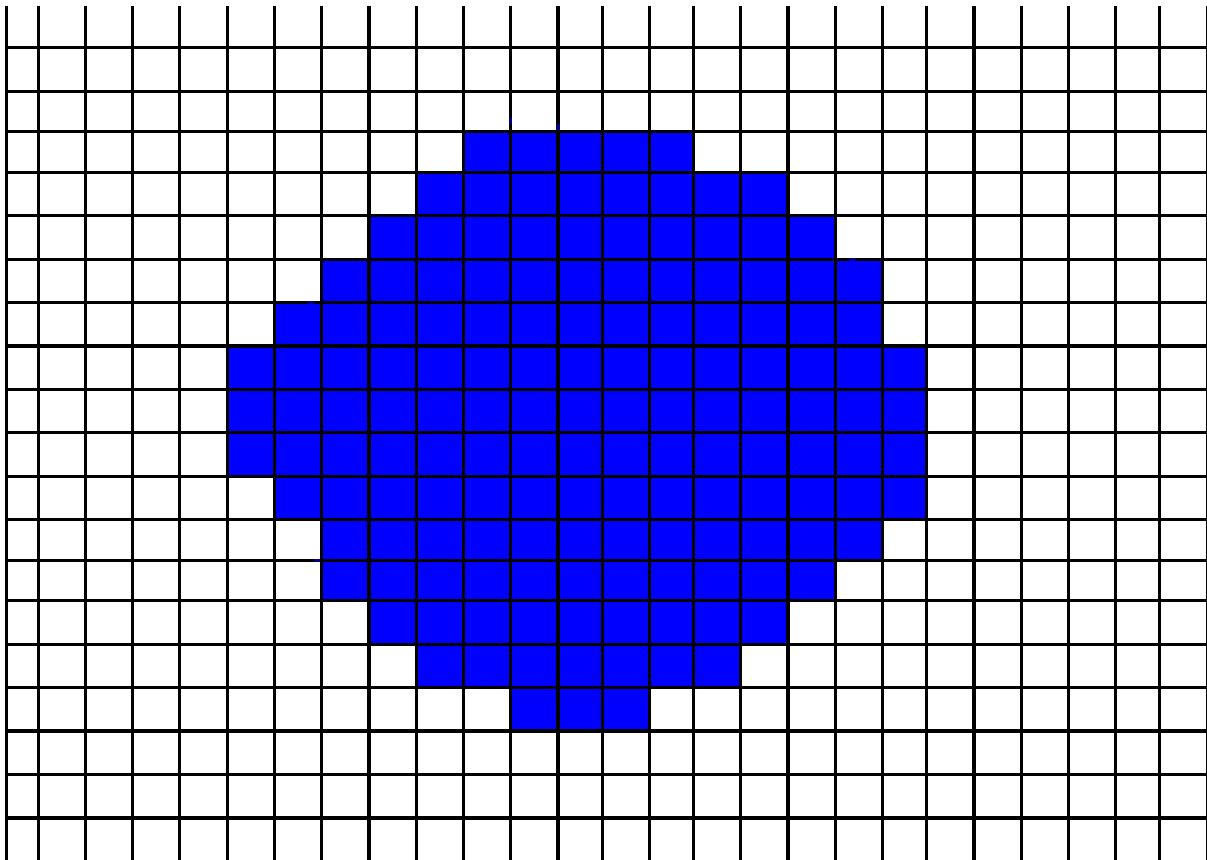**2D - No tracking –**
        Only 1 photo of particle

Camera

1
1
2
1
3
1
4
1
5
1
6
1
7
1

Sanderson
TECHNOLOGY

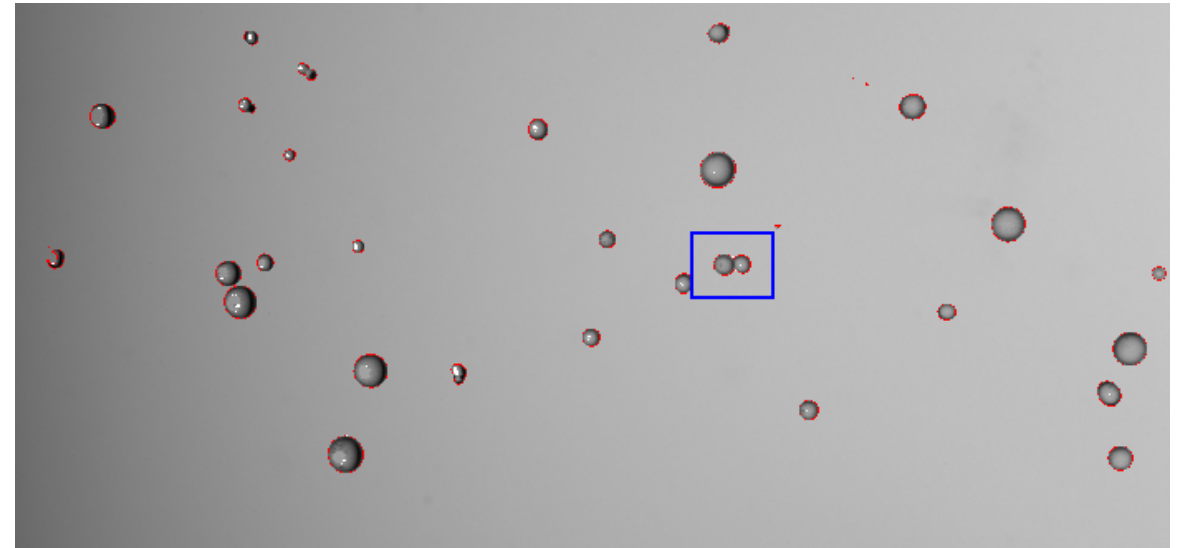# 3D Image analysis

Particles analysed with 3D Image Technology

Measurement Principle

The software counts the pixels covered by the particle

PROPERTIES

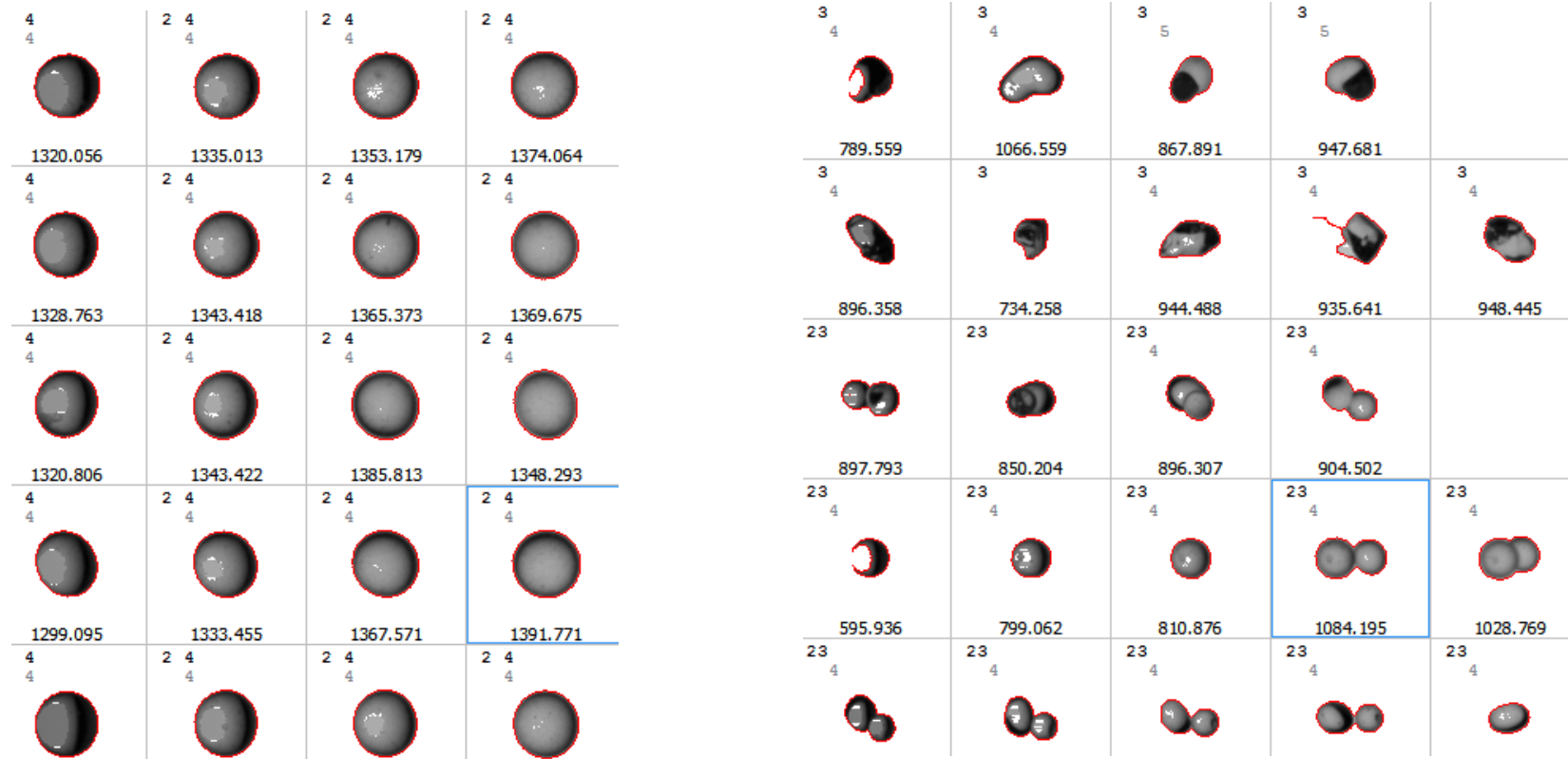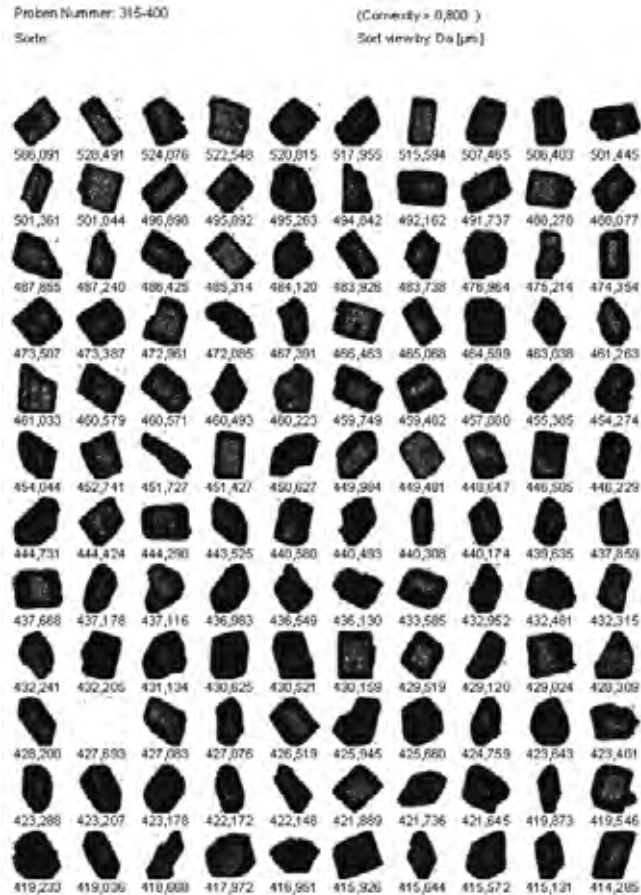|		
V	=	Volume
W	=	Weight
S	=	Surface
A	=	Projected Area
R	=	Sedimentation Rate
AE	=	Aerodynamic Rate

Filter Function
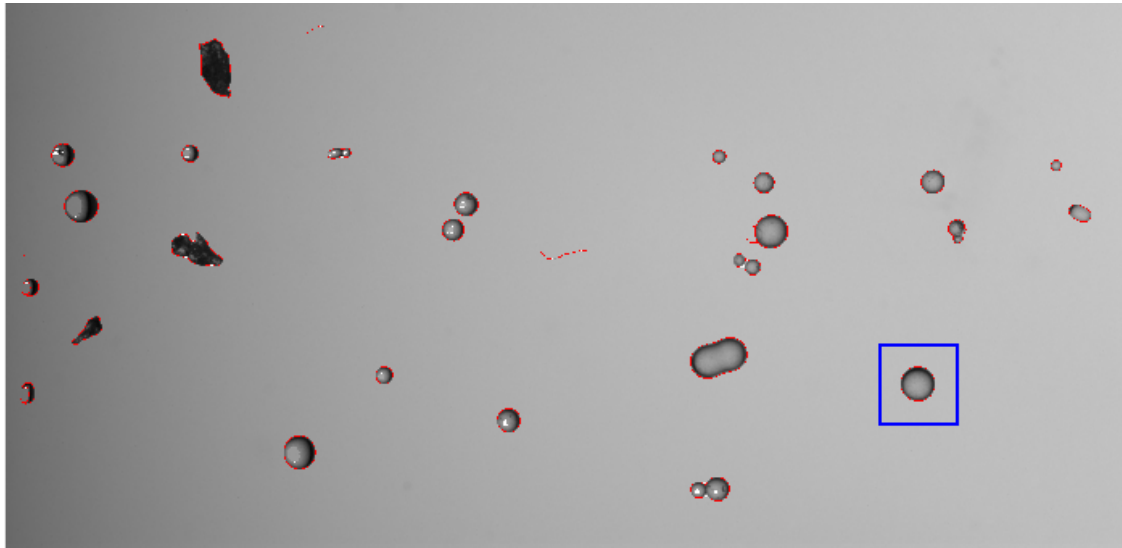
Glass Beads

Shape Factors

Good and Bad particle sorted and counted by user defined shapes factors

Results Analysis

Every Particle Measured And Recorded
Available for Further Analysis at a Future Date

The Advantages of 3D Image Analysis
(patented by Microtrac)

All three dimensions measured, including Thickness

More accurate volume distributions

Much more accurate size measurements

More accurate shape (sphericity) measurements

Enables accurate reporting of more than
36 morphological parameters

Private Company formed in 2014 and self funded
Formed by 5 seasoned entrepreneurs with expertise
in electronics, software, nmr, finance and application

MagnoMeter XRS

Sanderson TECHN●LOGY

- New analytical instrument for analysis of complex mixtures
- Measures macroscopic physical characteristics using multi-nuclear nmr
- Separate probe allows use in distant location
- XRS focused on dispersed particle surface area

Techniques

Relaxation

- particulate analysis
  - surface area, morphology and surface chemistry
    - sedimentation and aggregation
- molecular analysis
  - polymer complexation and surfactant adsorption
    - competitive adsorption/desorption

- **Diffusivity** either continuous or dispersed phase
  - total aggregate size (complexation)
  - restrictions to motion (restricted diffusion)
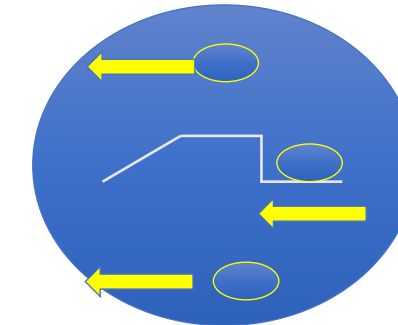   - emulsion drop size
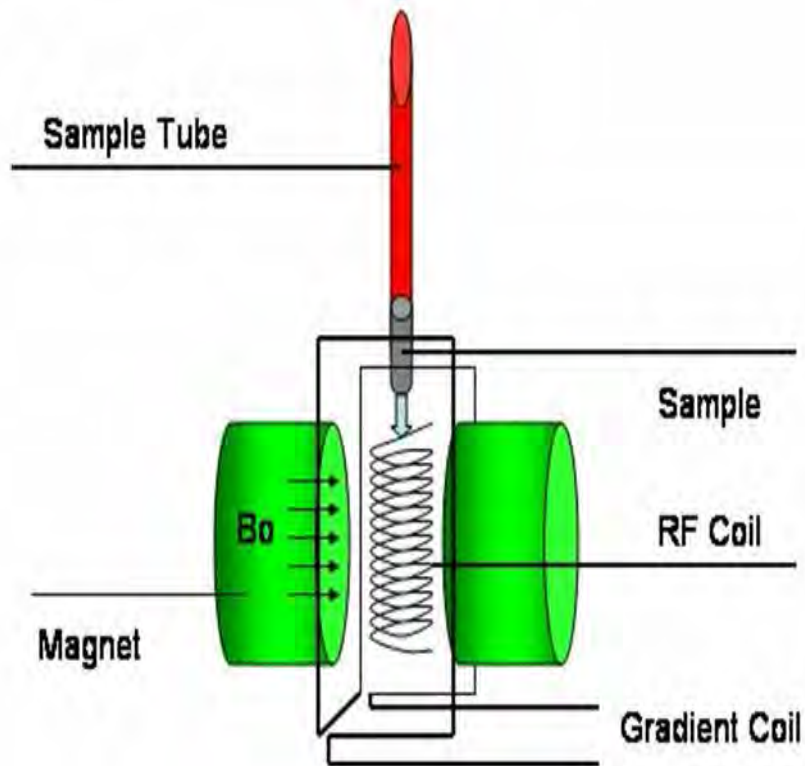
T1 AND T2 Pulse Sequences
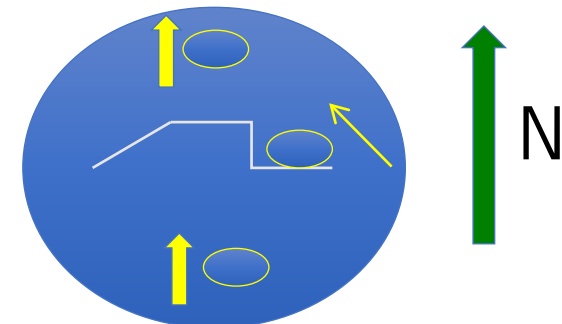
How does it Work?

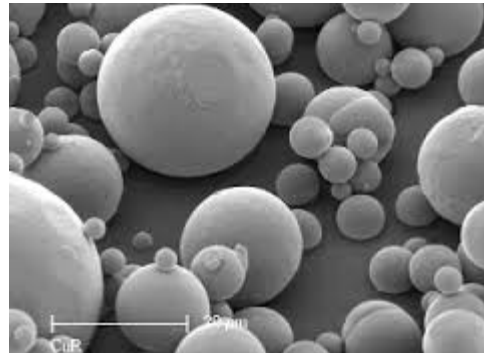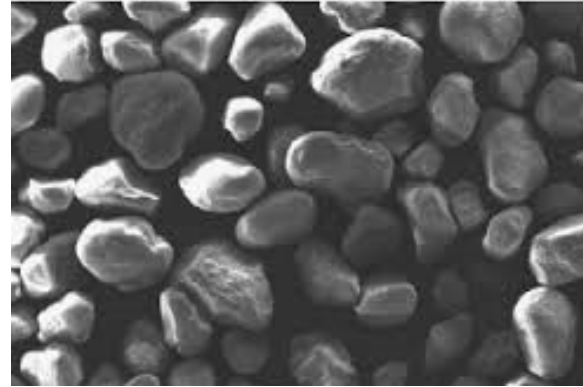Bound and unbound
water in solution
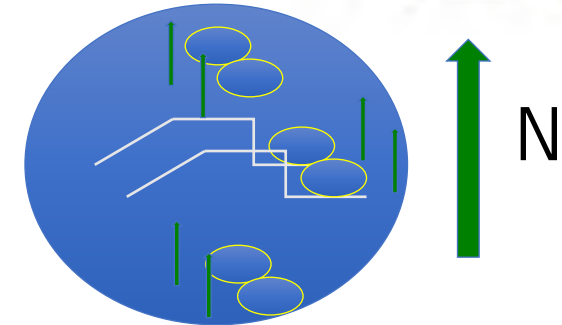
Apply a pulse
Nuclei will then relax
Unbound relax slower
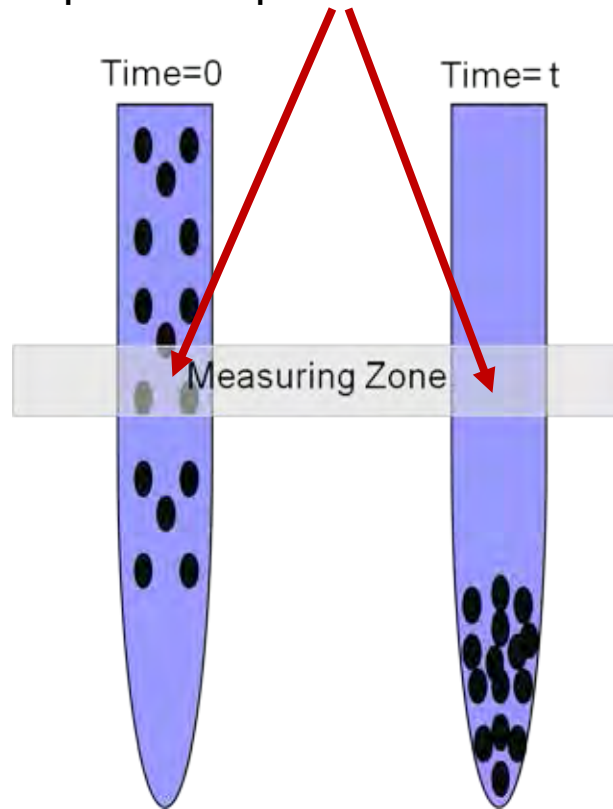
Measure relaxation
Calculate surface area

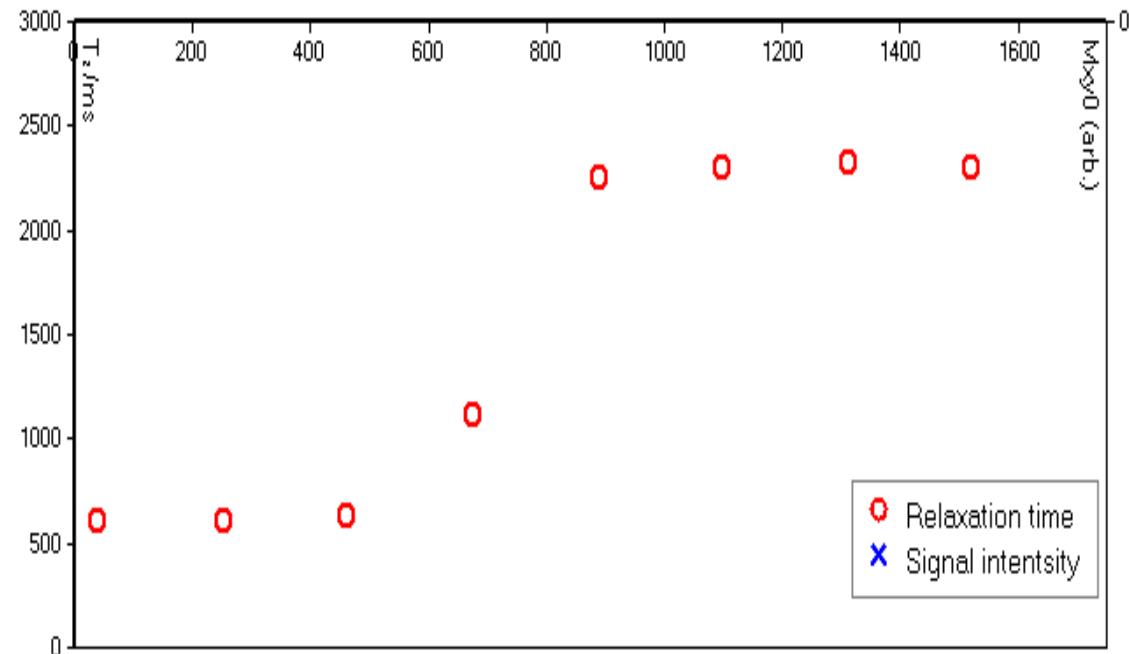# Application: Wetted Surface Area

Almost any particle of any size or shape

Application: Sedimentation

Relaxation time increases as settling particles pass out of the measuring zone
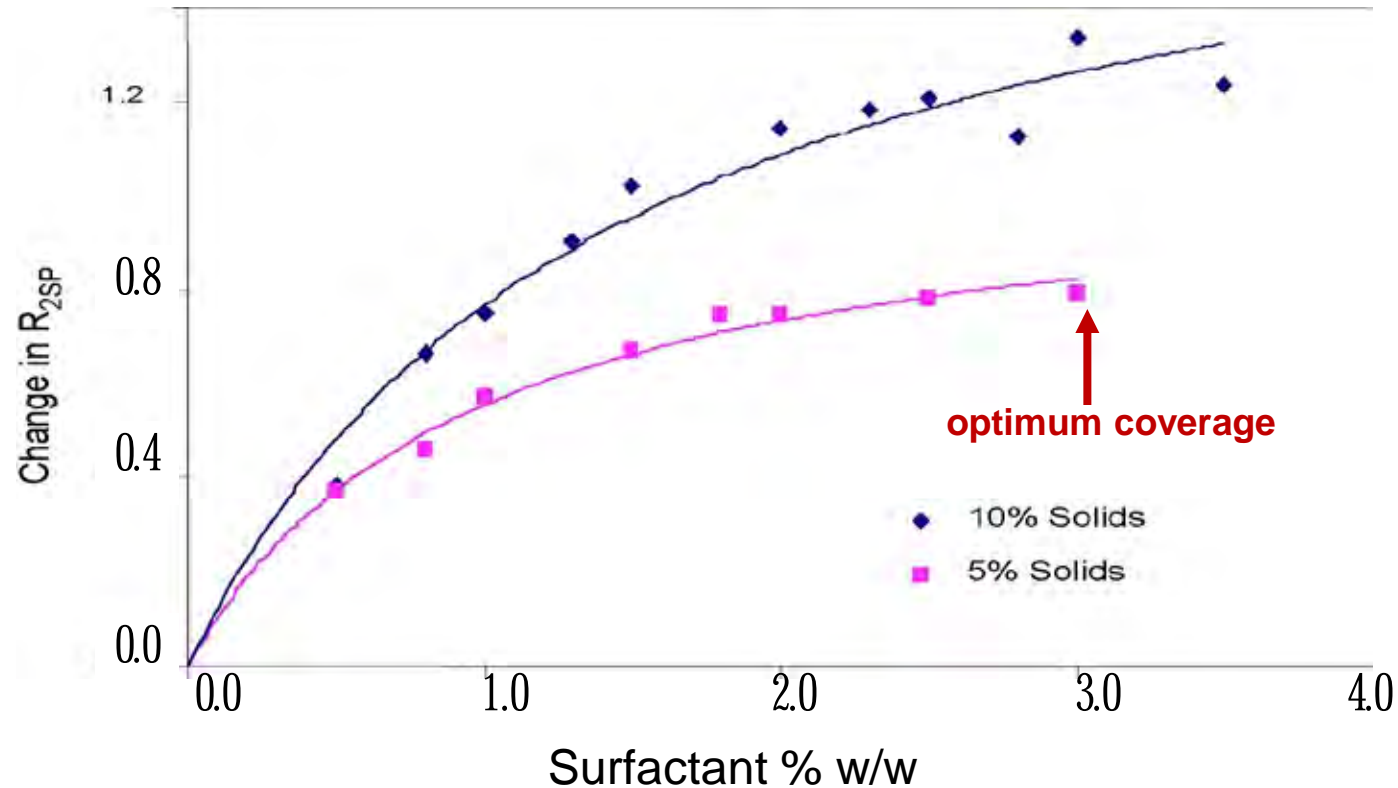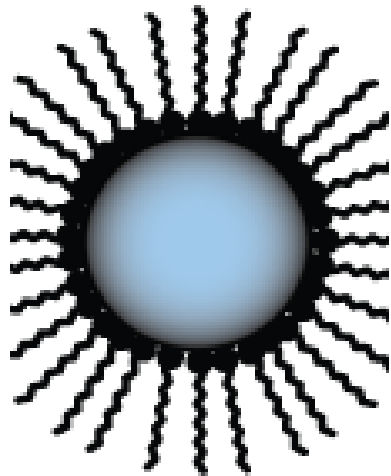
Sedimentation of a 10wt% aqueous suspension of 200nm Barium Titanate

Time mode allows monitoring of suspension stability

Application: *In situ* Surfactant Adsorption
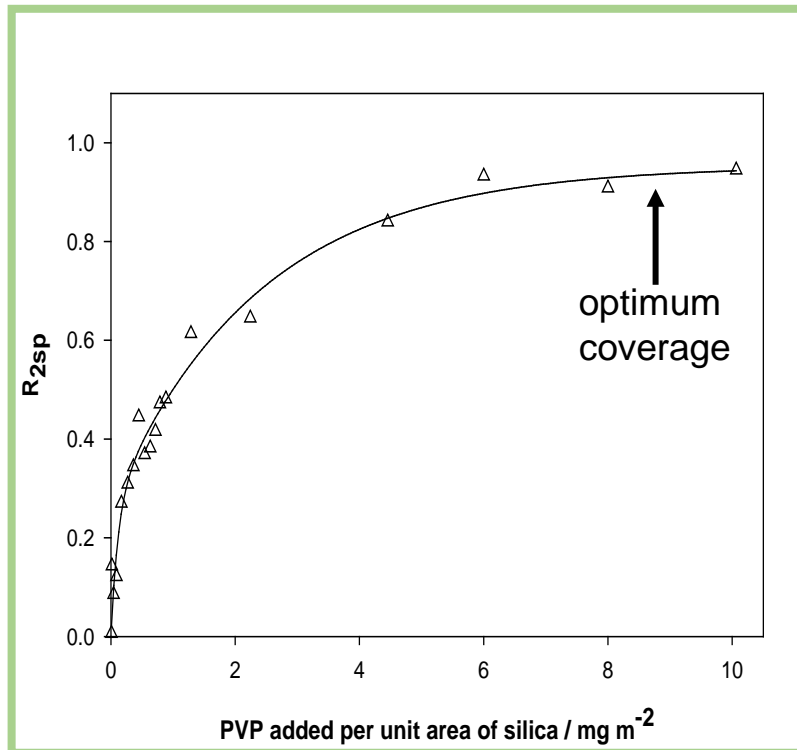
Particles: 50nm Silica
Surfactant: SDES

optimum coverage

Change in R_{2SP} vs Surfactant % w/w
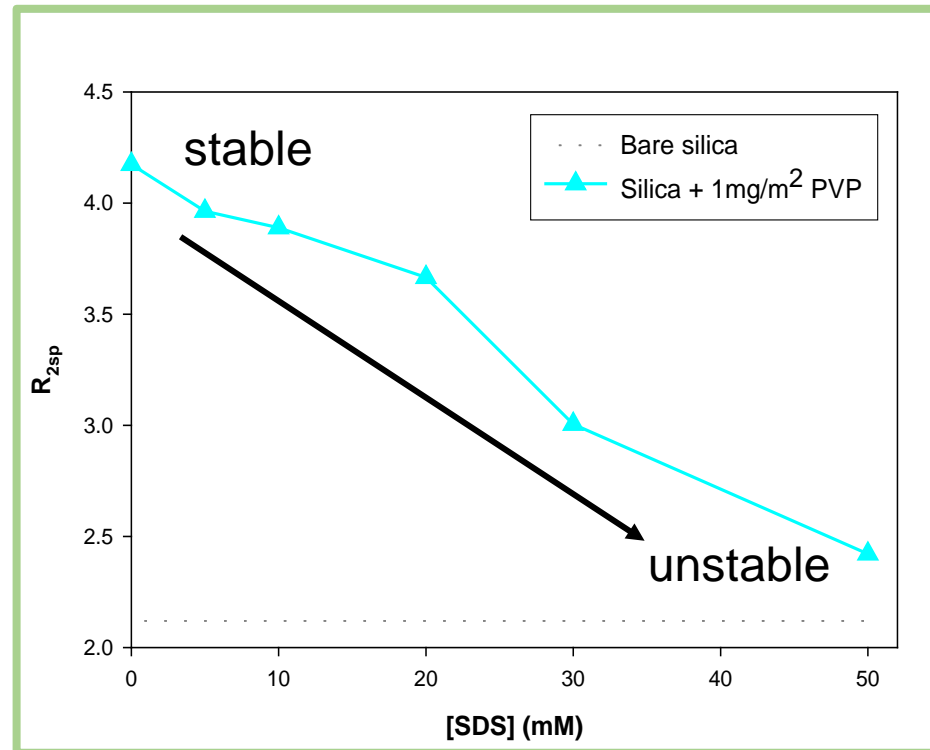
- ♦ 10% Solids
- ■ 5% Solids

NMR relaxation provides an easy *in-situ* measurement of adsorption onto a surface

Application: Competitive Adsorption of a Surfactant and Polymer onto 15nm Silica

Adsorption of PVP onto bare silica

Desorption of PVP upon addition of SDS

APPLICATIONS

QC application to control batch to batch reproducibility

- Pharmaceutical
- Inks
- Cosmetics
- Sunscreens
- Graphene/Graphite
- Oil and Gas
- Polymer application

Sanderson Technology
Available Techniques

Wetted surface area measurements – Bench Top NMR

Particle Size Distribution - Acoustic Attenuation Spectroscopy

Laser Diffraction, Dynamic Light Scattierng

Single Particle Optical Sizing (SPOS)

Zeta Potential – Electrokinetic Sonic Amplitude

Image Analysis

Materials Characterisation, Formulation Consultancy

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