LAB MANAGER'S INDEPENDENT GUIDE TO PURCHASING PARTICLE ANALYSIS/PARTICLE CHARACTERIZATION INSTRUMENTS

ACOUSTIC SPECTROSCOPY

Acoustic spectroscopy is useful if both particle size and zeta-potential need to be investigated.

Acoustic spectroscopy measures the attenuation and sound speed of ultrasound pulses as they pass through concentrated slurries. The measurements are made over a wide range of frequencies and the resulting spectra are used to calculate the particle size distribution over a range from 10 nanometers to more than 10 micrometers.

- Horiba DT-1201
- Dispersion Technology DT-100
- Dispersion Technology DT-300
- Matec APS-100
- Matec zetafinder
- Matec ZAS00
- Matec Zeta-APS
- Particle Sizing Systems 380ZLS

LIGHT SCATTERING

Light scattering is a popular technique for determining particle size. Dynamic light scattering can be used to measure smaller particles (less than a few microns) than is possible using static light scattering techniques.

A Dynamic
Dynamic light scattering works by observing the Doppler shift of the incident light due to the Brownian motion of the suspended particulates. When a coherent light source shines on these particles, light will be scattered from the particles, but the frequency will be shifted because the particles are in motion (Doppler shift). The speed of the particles determines how much the frequency is shifted.

- Micromeritics Vasco DLS
- Kumash Saturn Digisizer 5205
- Brookhaven Instruments BI-200SM
- Brookhaven Instruments 90Plus
- Brookhaven Instruments FOQELS
- Brookhaven Instruments ACOS
- Brookhaven Instruments NanoDLS
- Brookhaven Instruments BioDLS
- Wyatt Technology Dynapro Nanostar
- Wyatt Technology WyattQELS
- Wyatt Technology Dynapro Plate Reader
- Dantec Dynamics PDA HiDense
- Dantec Dynamics FiberPDA system
- Dantec Dynamics DualPDA

B Static
Modern static light scattering instruments have become the method of choice in most industries due to their analysis speed, wide size range, ease of use, flexibility, and reproducibility.

Static light scattering measures particle size by scattering light from the edge of the particle at an angle which is dependent on the size of the particle. Larger particles scatter light at relatively smaller angles than light scattered from smaller particles. From observing the intensity of light scattered at different angles, it is possible to determine the relative amounts of different sized particles.

- Brookhaven Instruments BI-MwA
- Brookhaven Instruments BI-200SM
- Wyatt Technology Dawn Heleos II
- Wyatt Technology MiniDawn Treos
- Microtrac Bluewave
- Microtrac S3500
- AIM AS-2011
- AIM AS-2012

Particle size characterization

Accurate particle size characterization is essential in many processes in a large number of industries and research areas, including pharmacology, cosmetics, nanotechnology, paints, pigments, food science, ceramics, textiles, geological science, polymer science, environmental science, catalysis and powder metallurgical science.

The term "particle size characterization" can be used to cover size measurement only, or any combination of size, shape, zeta potential, surface area and other parameters. A wide range of instruments is available to facilitate particle size characterization and tailored according to individual needs and requirements.

This purchasing guide attempts to simplify the range of available particle characterization instruments by categorizing them according to type and function.

START HERE

INTRODUCTION:

Particle size characterization

The accurate measurement of particle characteristics is essential in many industrial and research processes. A large number of particle characterization instruments are available, offering a wide range of options and functions. It is important to select the appropriate instrument for your specific needs in order to ensure optimal results.

When purchasing a particle characterization instrument the first consideration should be what characteristics need to be measured. Laser diffraction instruments are widely used for size measurements only, image analysis instruments tend to be used for size and shape data, while acoustic spectroscopy instruments can be used to measure both size and zeta potential.

SURFACE AREA SPECTROSCOPY

Surface area spectroscopy determines the way a solid interacts with its surroundings, and is the most widely used means of characterizing porous materials. Since the surface area corresponds to the roughness of the particle exterior and its porous interior, gas sorption is the preferred technique to measure particle surface area.

- Micromeritics SMS Surface Energy Analyzer
- Kumash Gemini 2390
- Kumash Tristar 3020
- Kumash ASAP 2020
- Kumash ASAP 2420
- Kumash Flowsorb III
- Kumash ASAP 2050
- Morrow Scientific BELSORP
- Quantachrome Instruments iQ Series
- AIM AS-3012

IMAGE ANALYSIS

Image analysis is becoming an increasingly popular tool for particle size and shape analysis of powders. Modern image analysis systems for particle characterization are capable of analyzing tens of thousands of particles in a matter of minutes with sensitivity down to below 1 µm.

Image analysis can be dynamic or static, both of which are used in many industrial applications.

A Dynamic
In dynamic image analysis, particles flow past one or more cameras. Dynamic image analysis generally has lower sensitivity than static systems.

- Horiba CAMSIZER
- Horiba CAMSIZER-XT
- Micrometrics Particle Insight
- Clemex PSA
- Spectro SpectroNIF Q200

B Static
In static image analysis, particles sit on a slide moved by an automated stage for inspection by camera and microscope. Static image analysis systems provide greater sensitivity and operate on more sophisticated software for more complex investigations.

- Horiba PSA300
- Malvern Sysmex FPIA-3000
- Sympatec PICTOS
- Sympatec PICTIS

NANOPARTICLE CHARACTERIZATION

The emergence and rapid evolution of the field of nanotechnology has created a requirement for particle characterization instruments capable of measuring particle sizes on the nanometer scale. Considerable effort has been devoted to developing instruments capable of measuring smaller and smaller particles, and a number of these are able to measure particles only nanometers in size.

- Horiba SZ-100
- Brookhaven Instruments 90Plus
- Brookhaven Instruments ZetaPlus
- Brookhaven Instruments ZetaPALS
- Brookhaven Instruments FOQELS
- Brookhaven Instruments BI-200SM
- Brookhaven Instruments ACOS
- Brookhaven Instruments NanoDLS
- Brookhaven Instruments BioDLS
- Brookhaven Instruments BI-XDC
- Brookhaven Instruments BI-DCP
- TSI 3936
- IZON qNano
- Nanosight LM10
- Nanosight LM20
- Nanosight NS200
- Nanosight NS300
- Microtrac Nanotrac Wave
- Bettersize Instruments BT-90
- Fritsch Nanotec Plus
- Fritsch 12 DynoSizer
- Beckman Coulter Delsa Nano C
- Beckman Coulter Delsa Nano S
- Beckman Coulter Delsa Nano HC
- Beckman Coulter Delsa Nano Z
- Particle Sizing Systems Nicomp 380

LASER DIFFRACTION

Laser diffraction can be used for the non-destructive analysis of wet or dry samples, with particles in the size range of 0.02 to 2000 microns, and has inherent advantages that make it preferable to other options for many different materials.

Laser diffraction techniques are useful if only the particle size needs to be investigated.

A Portable systems
Portable particle characterization instruments are useful when bench space is limited; offering efficient use of bench space, while preserving accuracy, precision, and resolution.

- Horiba LA-300
- Malvern Mastersizer micro

B Standard systems
Standard systems are the mainstay of laser diffraction for the measurement of particle size.

- Horiba LA-950
- Malvern Mastersizer 2000
- Malvern Mastersizer 2000E
- Malvern Insitec
- Cilas CILAS 990
- Cilas CILAS 1090
- Cilas CILAS 1190
- Bettersize Instruments 2000
- Bettersize Instruments 930DZ
- Bettersize Instruments 9300ST
- Bettersize Instruments 9300S
- Bettersize Instruments 2001
- Bettersize Instruments 2002
- Bettersize Instruments 2003
- Sympatec Helox
- Fritsch MicroTec Plus
- Beckman Coulter LS 13 320 MW
- Beckman Coulter LS 13 320 SW
- Beckman Coulter LS 200
- Particle Sizing Systems AccuSizer 780AD

C Spray droplet size systems
Measurement of droplet characterization in sprays and aerosols relies on a specific form of laser diffraction requiring dedicated instrumentation.

- Malvern Spraytec
- MicroTrac Aeratrac
- MicroTrac DIA
- Oxford Lasers VisiSizer D30
- Oxford Lasers VisiSizer portable
- Oxford Lasers VisiSizer S200
- Dantec Dynamics IPI
- Particle Sizing Systems Accusizer 780 APS

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