All-India Institute of Medical Sciences
Ansari Nagar, New Delhi-29
(RESEARCH SECTION)

Ref. No. 29/Prop/Path./AKD/18-19/RS

Dated: 11.01.2019

Subject: Purchase of *Dynamic Light Scattering (DLS)* for the Deptt. of Pathology, AIIMS, New Delhi-29 on proprietary basis- Inviting comments thereon.

*****

The request has been received from **Dr.A.K.Dinda, Professor, Pathology,** AIIMS to purchase the subjected item from **M/s.Aimil Ltd. (Mgf. M/s.Malvern Pnalytical** on proprietary basis. The proposal submitted by **M/s.Aimil Ltd.** and Performa Invoice and Departmental PAC certifications are attached.

The above documents are being uploaded for open information to submit objections, comments, if any, from any manufacturer regarding proprietary nature of the equipment/item within issue of 15 days giving reference **No. 29/Prop/Path./AKD/18-19/RS**. The comments should be received by office of Stores Officer (RS), Research Section at AIIMS on or before **25/01/2019 upto 12:00 noon,** failing which it will be presumed that any other vendor is having no comment to offer and case will be decided on merits.

STORES OFFICER (RS)

Encl: Related documents enclosed.
1. PAC Certificate enclosed.
2. Performa Invoice

ALL INDIA INSTITUTE OF MEDICAL SCIENCE
ANSARI NAGAR, NEW DELHI-110029

PROPRIETORY/SPECIFIC BRANT GOODS CERTIFICATE

1.	Item/Type/Model No. required	**Dynamic Light Scattering Detector**
2.	Is the item a spare part attachment or accessory for existing equipment.	NO
3.	Name of the manufacturers/ supplier of the item proposed by the indentor.	M/s Malvern Panalytical
4.	Are they sole manufacturers/sole Distributors of the item	YES
5.	Is there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. If the answer is yes, why the Same can't be procured. Demanding Officer should bring out Comparative functional advantages/cost effectiveness of the recommended item from these offered by other.	NO
6.	What were the efforts made to locate alternative source of supply or use other substitutes.	THE ITEM IS PROPRIETARY OF THE FIRM
7.	Why open/limited tender can't be resorted to, for locating alternative source.	
8.	Are the proprietory items certifying that the rates are reasonable or not.	YES, RATES ARE REASONABLE
9.	Any other justification for procuring item from single source.	THE FUNCTIONING OF THE EQUIPMENT FULFILLS THE CRITERIA OF PI's WORK. NO OTHER MANUFACTURERS HAVE COMPARITIVE FULFILLMENTS.

Signature of Indentor
(Demanding Officer)

Dr. A.K. DINDA
MD, PhD

I certify that the item 'at' Sr. No. 1 above is required to be procured on single tender basis as the source of supply is definitely known/the specified brand proposed was advantage in meeting our functional requirements and limited tender system could be dispended with as they would serve no useful purpose in this particular case.

4/1

डा० ललित कुमार/Dr. LALIT KUMAR
आचार्य एवं अध्यक्ष/Professor & Head
चिकित्सा अर्बुदविज्ञान विभाग/Deptt. of Medical Oncology
डा० बी०आर०ए० आई०आर०सी०एच० (अखिलभारतीय)

Dr. Adarsh W. Barwad

TECHNICAL SPECIFICATIONS FOR DYNAMIC LIGHT SCATTERING SYSTEM WITH ZETA POTENTIAL

1. PC controlled system for measurement of Particle size and Zeta Potential of dispersed particles/molecules in solution.

   Correlator: High sensitive correlator with minimum 1024 physical size channels or above.

   The optics must be fully pre-aligned with no user adjustment required.

   Measurement Type: Particle size and Zeta potential

   Particle Size:

   a. Measurement Principle: Dynamic Light Scattering
   b. Size Range: 0.3nm to 10.0 microns (hydrodynamic dia.) or better
   c. Sample Conc. Range: 0.00001% to 40% (% volume) or better
   d. Accuracy: Better than +/- 2% of NIST traceable latex standards
   e. Precision/repeatability: Better than +/- 2% of NIST traceable latex standards
   f. Particle Volume: 12 µL (minimum) or lower
   g. **Scattering Angle (Back):** Fixed 170° or better. Preferably system should take measure at variable positions within the cell, to minimize multiple scattering effect.
   h. System should have Adaptive Correlation : It should have the ability to automatically and dynamically classify correlation sub runs on the fly into steady state or transient events.
   i. System should have Optical Filter Wheel with Integrated Narrow Band Filter and DDLS polarisers – the narrow band filter should not be permanently installed, so it can be user selected to remove fluorescence when present on a sample by sample basis without suppressing signal when the sample does not fluoresce.

   Zeta Potential

   a. Measured Principle: Electrophoretic light scattering and should be capable to measure Aqueous/Polar Solvents and Oils, High Salts/ Non-Polar solvents based systems. It should use the method of Phase Analysis Light Scattering (PALS) to improve the repeatability of measurements of low mobility samples
   b. Measured range: +/- 500mV
   c. Size Range for Zeta Potential: 5 nm to 100 microns or above.
   d. Minimum sample volume : 40 µL (minimum) or lower
   e. Maximum sample conductivity : 260 mS/cm
   f. Disposable cells should be quoted to remove any cross contamination

   Light Source: He-Ne / Diode laser 633nm with 4 mW power or lower

   Detector: Avalanche Photo Diode for high sensitivity measurements.

   Temperature control range: 2-100°C or better

   Sampling Cell: Cuvette cell

   Measurement time: 1-2 minutes or less

Medical Superintendent A.I.I.M.S. Hospital New Delhi-110029

Dr. A.K. DINDA MD, PhD Professor Dept. of Pathology

Professor Department of Biochemistry All India Institute of Medical Sciences

Dr. Adarsh W. Barwad Assistant Professor Department of Pathology AIIMS, New Delhi

Dr. LALIT KUMAR Professor & Head Dept. of Medical Oncology Dr. B.R.A. I.R.C.H. (A.I.I.M.S.) New Delhi-110029

Output:

a. For particle size: differential/cumulative distributions; values for sizes at given percentages, fits to distribution models
b. For zeta potential: plot of zeta potential distribution, mean zeta value

Software:

a. The software should be Windows XP/Window 7 or 10 based. It should provide result such as particle size and zeta potential measurement determination.
b. The software should have in built diagnostic features like Size Quality Report and Zeta Quality Report with the ability to provide expert advice based on the rate data that has been accumulated. The raw data should be available later for analysis & use with other software modules.

Light Weight & Portable Instrument
User friendly Software based on Microsoft Windows 7 or 10

2. **Computer:** Windows ® 7 or 10,64bit OS, 4th generation i7 Processor, 8GB physical memory and 1TB hard drive & DVD DriveWide Screen Monitor & Software supports for the equipment
3. **12mm square disposable polystyrene cuvettes with stoppers: 100 numbers**
4. **Disposable Zeta Potential cells should be quoted to remove any cross contamination: 20 numbers**
5. **General:**
   - Power requirements: 240V, 50 HZ
   - Operating environment temperature: 20-35 degree C
   - Operating environment humidity – 40 to 90%
   - Should be free from any vibration
   - Vendor to quote for One year Warranty and additional AMC cost for the system.
   - Prices need to be quoted in FOR AIIMS.

6. **ANY OBJECTIONS AGAINST THIS PRORIETARY PURCHASE MAY KINDLY MEET PROF. A. K. DINDA ALONG WITH THE DEMONSTRATIONS AT ROOM NO. 3006, DEPT. OF PATHOLOGY, CONVERGENCE BLOCK, AIIMS WITHIN 15 DAYS OF PUBLICATIONS OF THE SPECIFICATIONS ON AIIMS WEBSITE**

Medical Superintendent
A.I.I.M.S. Hospital
New Delhi-110029

PROF. LALIT KUMAR
Professor & Head
Dept. of Medical Oncology
Dr. B.R.A.I.R.C.H. (A.I.I.M.S.)
Ansari Nagar, New Delhi-110029

A.K. DINDA
MD, PhD
Professor
Dept. of Pathology
All India Institute of Medical Sciences
New Delhi-110 029

Dr. Adarsh W. Barwad
Assistant Professor
Department of Pathology
AIIMS, New Delhi

Dr. Pathologist Oncopathology, MD, PhD
Professor
Department of Biochemistry
All India Institute of Medical Sciences

Prof. Amit Kumar Dinda, *MD, PhD*
Department of Pathology, All India Institute of Medical Sciences, New Delhi
Secretary, Indian Society of Nanomedicine (ISNM)
Ex-President, Indian Society of Renal & Transplant Pathology (ISRTP)
Ex-VicePresident, Society for Tissue Engineering and Regenerative Medicine (India) (SABOI)
Fellow, Electron Microscopy Society of India (EMSI)

26.12.2018

Store Officer,
Research Section,
AIIMS, New Delhi -110029

Sub: Justification for Purchase of DLS on Proprietary basis

Dear Sir,

In reference to the project no. I hereby request you to purchase the DLS on proprietary basis due to the following justifications as mentioned:

1. Non-Invasive Back Scatter (NIBS) - Patent No. EP884580, US6016195, JP 11051843
2. High and Low Frequency Electrophoresis (M3) – Patent No. EP 1154266, US7217350, JP04727064
3. Light Scattering Measurement using simultaneous detection – Patent No. EP 2235501, CN102066901, US20090251696

JUSTIFICATIONS:

1. Non-Invasive Back Scatter (NIBS)

Non-Invasive back scatter is sensitive as the particle being measured is directly on the surface of the fiber and all the light scattered back in detection solid angle is taken up by the multimodal fiber placed in the suspension (invasive).

All Dynamic Light Scattering equipments use this standard Back Scatter Technique where use of a focusing lens allows both the laser and detector fiber to be placed outside the suspension and light scattered only at one particular angle and dimension is picked up by a single mode optical fiber and quantified.

Malvern Zetasizer PRO uses a patented technique of using multimode optical fiber and gradient index lens to pick up all the scattered photons at a particular back scatter conical angle (surface of a cone with backscatter angle vertex).

Malvern Zetasizer PRO can detect all the rays scattered at the designated conical angle (175o) while other competitor instruments can detect only one ray in the designated angle; hence Malvern Zetasizer PRO is more sensitive in photon detection and correlation estimation.

2. High and Low Frequency Electrophoresis (M3)

Different instruments use different techniques to overcome the effect of electrode fouling and polarization during zeta potential measurement in high ionic strength suspensions. Malvern's Zetasizer PRO uses their own patented M3PALS technique. Malvern Zetasizer PRO can discriminate upto three zeta peaks and also give the percentage of nanoparticles conforming to those zeta values (as required in our specifications) while other competitor instruments can only give the mean zeta potential and its standard deviation. It fails to identify subpopulations of nanoparticles with different zeta potentials within the same sample. Also by using the patented diffusion barrier technique, Malvern Zetasizer PRO can handle high ionic suspension without electrode fouling.

Room No. 1084, 1st Floor, Teaching Block, Department of Pathology
All India Institute of Medical Sciences, New Delhi - 110 029

Prof. Amit Kumar Dinda, *MD, PhD*
Department of Pathology, All India Institute of Medical Sciences, New Delhi
Secretary, Indian Society of Nanomedicine (ISNM)
Ex-President, Indian Society of Renal & Transplant Pathology (ISRTP)
Ex-VicePresident, Society for Tissue Engineering and Regenerative Medicine (India) (SABOI)
Fellow, Electron Microscopy Society of India (EMSI)

3. Light Scattering Measurement using simultaneous detection
Other competitors instruments can detect scattering at 3 angles (back, side & forward), it is NOT SIMULTANEOUS; i.e. detection does not occur at both the channels at the same time. While large particles (agglomerates) scatter more in the forward direction and smaller particles in backward direction, Malvern Zetasizer Pro can detect scattering in both directions simultaneously and whenever the forward scattering is more as in agglomerates, the back scatter reading at that instant is disregarded (real-time or post-processing gating) for calculation of photon correlation. By this method, Malvern Zetasizer PRO is superior to existing similar instruments by preventing the final size calculation being biased towards the higher side by the presence of contaminating agglomerates and also gives a numerical aggregation index to judge the quality of the preparation.

4. Malvern Zetasizer PRO has Optical Filter Wheel with Integrated Narrow Band Filter and DDLS polarisers:
This means the narrow band filter is not permanently installed, so it can be user selected to remove fluorescence when present on a sample by sample basis without supressing signal when the sample does not fluoresce. The horizontal and verticla polarisers allow collection of particle size data in Backcatter and therefore perform DDLS measurements that may highlight such physcial phenomena as rotational diffusion or assymetry in samples. This is particularly useful in samples such as Gold/Quantam Dots without compromising the sensitivity for other samples.

Also, the said equipment is considered as standard for initial characterization of nanoparticles across the globe and has been cited in more than 1000s of publications.

Keeping above points in mind, I request you to kindly permit us to purchase this equipment under proprietary head.

Kindly do the needful at the earliest.

Thanking you,
Sincerely,

Prof. A. K. Dinda

Dr. A.K. DINDA
MD, PhD
Professor
Deptt. of Pathology
All India Institute of Medical Sciences
Ansari Nagar, New Delhi-110 029

Room No. 1084, 1st Floor, Teaching Block, Department of Pathology
All India Institute of Medical Sciences, New Delhi - 110 029

Malvern Panalytical

Malvern Panalytical Ltd.
Enigma Business Park
Malvern, Worcestershire
UK. WR141XZ

info@malvernpanalytical.com
www.malvernpanalytical.com

To Whom it may concern.

Date of Issue: 20/11/2018

Re. Letter of Unicity/Propiertary Certificate

This letter certifies that the Zetasizer Ultra [ZSU5700]* and Zetasizer Pro [ZSU5800] of Malvern Panalytical Limited UK, which uses the techniques of dynamic light scattering and electrophoretic light scattering to measure the size, mobility and zeta potential of particles in dispersions is, at the date of issue, UNIQUE for the following characteristics and/or performances:

- *MADLS® - Multi Angle Dynamic Light Scattering ability to perform multiple DLS measurements at multiple angles and solve the complex correlation function to product a single DLS result independent of angle or concentration [assuming within measurable range]. This gives high resolution i.e. the ability to resolve distributions up to 2:1 [standard DLS is not consistently able to resolve at 3:1]. Results are reported by Intensity [at 173 degrees] and as angular independent Volume distributions.
- *MADLS Particle Concentration – ability to measure particle concentrations using a calibration free, ensemble approach, based on the light scattering intensity of individual size modes to provide a measure of particle concentration of the sample modes in particles/mL.
- High and Low Frequency Electrophoresis (M3-PALS) an apparatus able to determine the zeta potential distribution of a particle dispersion contained in a cell/cuvette free of the effects of electro-osmosis.
- Adaptive Correlation - the ability to automatically and dynamically classify correlation sub runs on the fly into steady state or transient events. This has multiple advantages : speeds measurement up two to three fold, gives more stable and repeatable results typically with less sample preparation, increases measurement precision five fold and increases the sensitivity to small amounts of large material by treating transient events separatley to those more representative of the sample. Adaptive Correlation requires no assumptions to be made by the use, works across all size ranges measurable and at all angles measurable with no data rejection.
- Option to utilise Laser Doppler Electrophoresis Using a Diffusion Barrier to minimise sample degradation, decrease volume requirements to 20µl and increase robustness of measurements in high conductivity media.
- *Low volume Capillary Sizing Cell – reduces sample volume to 3 uL but in a high quality disposable glass capillary cell, and increases upper measurable size limit to 10 um [latex] without the need for density matching of the sample dispersant to particle density.
- Optical Filter Wheel [Patent Pending] with integrated Narrow Band Filter and DDLS polarisers – this means the narrow band filter is not permanently installed, so it can be user selected to remove fluorescence when present on a sample by sample basis without supressing signal when the sample does not fluoresce. The horizontal and verticle polarisers allow collection of particle size data in

Dr. A.K. DINDA MD, PhD Professor

Dr. Adarsh W. Bansod Assistant Professor Department of Pathology AIIMS, New Delhi

Backcatter and therefore perform DDLS measurements that may highlight such physcial phenomena as rotational diffusion or assymetry in samples.

- Deep Learning AI – Gives real time size data quality analysis and advice on how to use the data or corrective action for the sample. Supports novice users with expert data analysis and advice.

Patents Granted:

High and Low Frequency Electrophoresis (M3-PALS)

- EP1154266
- US7217350
- JP04727064

Light Scattering Measurements using Simultaneous Detection

- EP2235501
- CN102064801
- JP2011523451
- US2009251696

Diffusion Barrier Method

- WO2012080272A1
- JP2013546003

Patents Pending:

MADLS
Adaptive Correlation
Low Volume Capillary Cell
DDLS Automation/Filter Wheel

*=Ultra only

On behalf of Malvern Panalytical Ltd.

Darrell Bancarz – Product Manger - Nanomaterial

Dr. A.K. DINDA MD, PhD Professor

Dr. Adarsh W. Bansod Assistant Professor Department of Pathology AIIMS, New Delhi

US006016195A

United States Patent [19]

Peters

[11] Patent Number: 6,016,195

[45] Date of Patent: Jan. 18, 2000

[54] **FIBER OPTIC DEVICE FOR DETECTING THE SCATTERED LIGHT OR FLUORESCENT LIGHT FROM A SUSPENSION**

[75] Inventor: **Rainer Peters**, Langen, Germany

[73] Assignee: **ALV-Laser Vertriebsgesellschaft mbH**, Langen, Germany

[21] Appl. No.: **09/094,777**

[22] Filed: **Jun. 15, 1998**

[30] **Foreign Application Priority Data**

Jun. 15, 1997 [DE] Germany 197 25 211

[51] **Int. Cl.**[7] **G01N 21/00**

[52] **U.S. Cl.** **356/342**; 356/337; 356/73.1

[58] **Field of Search** 356/342, 337, 356/73.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,099,875 7/1978 McMahon 356/342

5,144,312 8/1992 Thompson 356/218

OTHER PUBLICATIONS

Wiese, H. and Hoen, D., "Single–mode fibers in fiber–optic quasielastic light scattering: A study of the dynamics of concentrated latex dispersions", May 15, 1991, J. Chem. Phys. 94(10), American Institute of Physics, pp. 6429–6443.

Ansari, Rafat R. et al., "Microemulsion characterization by the use of a noninvasive backscatter fiber optic probe", Jul. 20, 1993, Applied Optics, vol. 32, No. 21, pp. 3822–3827.

Rogers, Richard B. et al., "A Compact Laser Light Scattering Instrument for Microgravity Research", 1996, Photon Correlation & Scattering, 1996 Technical Digest Series, vol. 14, pp. 40–42.

Ricka, Jaroslav, "Dynamic light scattering with single–mode and multimode receivers", May 20, 1993, Applied Optics, vol. 32, No. 15, pp. 2860–2875.

Primary Examiner—Robert Kim

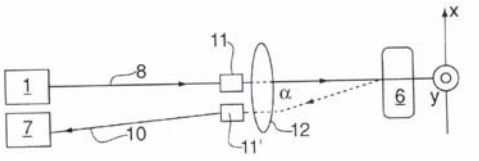
Assistant Examiner—Reginald Ratliff

Attorney, Agent, or Firm—Kenyon & Kenyon

[57] **ABSTRACT**

The present invention relates to a fiber optic detector for detection of scattered light or fluorescent light from a liquid suspension, comprising: a lighting optical fiber for transmitting light to a lighting optical fiber outlet; a first gradient index lens disposed at the lighting optical fiber outlet to parallelize light; a detecting optical fiber for transmitting back-scattered light from a detecting optical fiber inlet; a second gradient index lens disposed at the detecting optical fiber inlet to parallelize back-scattered light; and at least one means for focusing parallelized light transmitted from the lighting optical fiber on a point and for focusing light back-scattered from the point to the second gradient index lens of the detecting optical fiber for transmission by the detecting optical fiber.

20 Claims, 3 Drawing Sheets



US007217350B2

(12) **United States Patent**
Mc.Neil-Watson et al.

(10) **Patent No.: US 7,217,350 B2**
(45) **Date of Patent: May 15, 2007**

(54) **MOBILITY AND EFFECTS ARISING FROM SURFACE CHARGE**

(75) Inventors: **Fraser Keith Mc.Neil-Watson**, Worcestershire (GB); **Malcolm Trevor Connah**, Worcestershire (GB)

(73) Assignee: **Malvern Instruments Limited**, Worcestershire (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1163 days.

(21) Appl. No.: **09/843,339**

(22) Filed: **Apr. 26, 2001**

(65) **Prior Publication Data**

US 2002/0040851 A1 Apr. 11, 2002

(30) **Foreign Application Priority Data**

Apr. 29, 2000 (GB) 0010377.0

(51) **Int. Cl.**
C02F 1/469 (2006.01)
C07K 1/26 (2006.01)
B01D 57/02 (2006.01)
B01D 59/42 (2006.01)

(52) **U.S. Cl.** **204/549**; 204/601; 204/603; 204/452; 204/456; 204/451

(58) **Field of Classification Search** 204/549, 204/601, 603, 452, 456, 451
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,097,153 A * 6/1978 DeRemigis 204/549
4,101,220 A * 7/1978 Bean et al. 204/549
4,351,709 A * 9/1982 Goetz 204/549
5,245,290 A * 9/1993 Cannon et al. 324/457

FOREIGN PATENT DOCUMENTS

WO WO8802482 A 4/1988
WO WO 93/04363 3/1993
WO WO9304363 A 3/1993

* cited by examiner

Primary Examiner—Ling-Siu Choi
(74) *Attorney, Agent, or Firm*—Baker Botts LLP

(57) **ABSTRACT**

A method of, and apparatus for, automatically determining an electric charge—related characteristic or derived parameter of particles in a dispersion or of a cell wall, comprises having a particle—containing dispersion provided in a cell. The dispersion is illuminated with light from a light source and detecting from a detection volume light scattered from the particles. An electric field is applied to the dispersion at a first frequency of change of direction of the electric field and an electric field is subsequently applied to the dispersion at a second frequency of change of direction of the electric field. First signals detected from the scattered light when the first frequency electric field is applied are used to provide first values related to the velocity distribution of the particles. A second velocity related signal or value derived from scattered light during the time that the second frequency electric field is applied is used to modify the velocity distribution related values to produce a modified particle velocity-related distribution; and the first frequency is low enough to obtain an acceptable resolution of the distribution of particle velocity—related values.

9 Claims, 11 Drawing Sheets

US007217350B2

(12) **United States Patent**
Mc.Neil-Watson et al.

(10) **Patent No.: US 7,217,350 B2**
(45) **Date of Patent: May 15, 2007**

(54) **MOBILITY AND EFFECTS ARISING FROM SURFACE CHARGE**

(75) Inventors: **Fraser Keith Mc.Neil-Watson**, Worcestershire (GB); **Malcolm Trevor Connah**, Worcestershire (GB)

(73) Assignee: **Malvern Instruments Limited**, Worcestershire (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1163 days.

(21) Appl. No.: **09/843,339**

(22) Filed: **Apr. 26, 2001**

(65) **Prior Publication Data**

US 2002/0040851 A1 Apr. 11, 2002

(30) **Foreign Application Priority Data**

Apr. 29, 2000 (GB) 0010377.0

(51) **Int. Cl.**
C02F 1/469 (2006.01)
C07K 1/26 (2006.01)
B01D 57/02 (2006.01)
B01D 59/42 (2006.01)

(52) **U.S. Cl.** **204/549**; 204/601; 204/603; 204/452; 204/456; 204/451

(58) **Field of Classification Search** 204/549, 204/601, 603, 452, 456, 451
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,097,353 A * 6/1978 DeBenigis 204/549
4,101,220 A * 7/1978 Ikeda et al. 204/549
4,351,709 A * 9/1982 Gratz 204/549
5,245,290 A * 9/1993 Cannon et al. 324/457

FOREIGN PATENT DOCUMENTS

WO WO88/02482 A 4/1988
WO WO 93/04363 3/1993
WO WO93/04363 A 3/1993

* cited by examiner

Primary Examiner—Ling-Siu Choi
(74) *Attorney, Agent, or Firm*—Baker Botts LLP

(57) **ABSTRACT**

A method of, and apparatus for, automatically determining an electric charge—related characteristic or derived parameter of particles in a dispersion or of a cell wall, comprises having a particle—containing dispersion provided in a cell. The dispersion is illuminated with light from a light source and detecting from a detection volume light scattered from the particles. An electric field is applied to the dispersion at a first frequency of change of direction of the electric field and an electric field is subsequently applied to the dispersion at a second frequency of change of direction of the electric field. First signals detected from the scattered light when the first frequency electric field is applied are used to provide first values related to the velocity distribution of the particles. A second velocity related signal or value derived from scattered light during the time that the second frequency electric field is applied is used to modify the velocity distribution related values to produce a modified particle velocity-related distribution; and the first frequency is low enough to obtain an acceptable resolution of the distribution of particle velocity—related values.

9 Claims, 11 Drawing Sheets

US009435726B2

(12) **United States Patent**
Smart et al.

(10) **Patent No.: US 9,435,726 B2**
(45) **Date of Patent: Sep. 6, 2016**

(54) **DYNAMIC AND DEPOLARIZED DYNAMIC LIGHT SCATTERING COLLOID ANALYZER**

(71) Applicant: **Scattering Solutions, Inc.**, Irvine, CA (US)

(72) Inventors: **Anthony E. Smart**, Costa Mesa, CA (US); **William V. Meyer**, Lakewood, OH (US); **Craig J. Saltiel**, Irvine, CA (US)

(73) Assignee: **Scattering Solutions, Inc.**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/707,146**

(22) Filed: **May 8, 2015**

(65) **Prior Publication Data**

US 2015/0355088 A1 Dec. 10, 2015

Related U.S. Application Data

(63) Continuation of application No. 14/222,774, filed on Mar. 24, 2014, now Pat. No. 9,052,261, which is a continuation of application No. 12/863,079, filed on Aug. 23, 2010, now Pat. No. 8,717,562.

(51) **Int. Cl.**
G01N 15/02 (2006.01)
G01N 15/10 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G01N 15/10*** (2013.01); ***G01N 15/0211*** (2013.01); ***G01N 15/1434*** (2013.01); ***G01N 21/49*** (2013.01); *G01N 21/51* (2013.01); *G01N 2015/0222* (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G01N 15/0205; G01N 15/0211; G01N 15/1459; G01N 2021/4716; G01N 15/1434
USPC 356/336
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,975,237 A 12/1990 Watling
5,946,092 A 8/1999 Dalbasti et al.
(Continued)

OTHER PUBLICATIONS

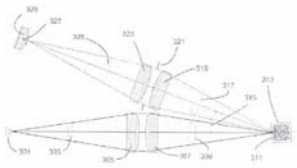
Office Action dated Apr. 4, 2013 for U.S. Appl. No. 12/863,079.
(Continued)

Primary Examiner — Tarifur Chowdhury
Assistant Examiner — Md M Rahman
(74) *Attorney, Agent, or Firm* — Wolf, Greenfield & Sacks, P.C.

(57) **ABSTRACT**

Apparatus are described for measuring the characteristics of colloidal particles suspended in transparent media by Dynamic Light Scattering (DLS) and Depolarized Dynamic Light Scattering (DDLS) into regions where conventional measurements are difficult or impractical. Matching the diameter of an illuminating beam and an intersecting diameter of a field stop image extends measurements into regions that include concentrated turbid suspensions that frequently appear so visually opaque that multiple scattering typically gives a falsely low estimate of particle size. At the opposite extreme, where insufficient signal is available to determine either or both of the translational and/or rotational relaxation times of the particles, typically where they are too small, too few, or of insufficient refractive index difference from the medium to scatter enough light, measurements can be improved by: a) using a sufficiently large aperture such that many coherence areas fall upon the detector; and b) optical homodyne amplification of the scattered signal.

20 Claims, 14 Drawing Sheets



Optical Configuration for Aircill Matched Field.

Dr. A.K. DINDA
MD, PhD
Professor

US 20090251696A1

(19) **United States**
(12) **Patent Application Publication**
McNeil-Watson et al.

(10) **Pub. No.: US 2009/0251696 A1**
(43) **Pub. Date: Oct. 8, 2009**

(54) **LIGHT SCATTERING MEASUREMENTS USING SIMULTANEOUS DETECTION**

(76) Inventors: **Fraser McNeil-Watson**, Malvern (GB); **Malcolm Connah**, Malvern (GB); **Robert Jack**, Bromsgrove (GB); **David McKnight**, Coventry (GB)

Correspondence Address:
KRISTOFER E. ELBING
107 PELHAM ISLAND ROAD
WAYLAND, MA 01778 (US)

(21) Appl. No.: **12/421,123**

(22) Filed: **Jun. 15, 2009**

Related U.S. Application Data

(60) Provisional application No. 61/061,143, filed on Jun. 13, 2008.

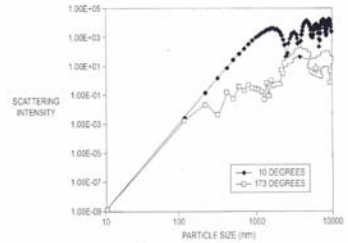
Publication Classification

(51) **Int. Cl.**
G01N 15/02 (2006.01)

(52) **U.S. Cl.** **356/336**

(57) **ABSTRACT**

Methods and apparatus for measuring particle characteristics are disclosed. In one aspect, an amount of light arising from interaction between light and a suspended sample is detected simultaneously with the acquisition of a photocurrent from a different direction. At least one measure of particle characteristics can then be derived based at least in part on fitting between information from the steps of acquiring and detecting.



Dr. A.K. DINDA
MD, PhD
Professor
Dept. of Pathology
All India Institute of Medical Sciences
Ansari Nagar, New Delhi-110 029

Malvern Panalytical

Malvern Panalytical Ltd
Grovewood Road, Malvern
Worcestershire, WR14 1XZ UK.

Tel +44 1684 892456
Fax +44 1684 892789

Company registered in England No 1020602

29th January 2018

To Whom It May Concern

We, Malvern Panalytical Limited, hereby certify that Aimil Ltd, with head office at Naimex House, A-8 Mohan Cooperative Ind Est, Mathura Road, New Delhi 110 044, having its offices at Mumbai, Bangalore, Vadodara, Chennai, Hyderabad, Indore, Chandigarh, Lucknow, Kolkata and Kochi, is the exclusive distributor of Malvern Panalytical in India for the following products Zetasizer Nano series, Mastersizer series & Spraytec, Insitec, Morphologi G3 and G3-ID, Rheometers, GPC systems, NanoSight and is fully authorized to sell and to provide service support for Malvern products.

Aimil is our authorized Indian agent for providing Sales and after Sales Support including Sales of AMC, Spare parts & Consumables in local Indian currency i.e. INR up to the limit of 25 Lakhs, above this limit they can quote in GBP.

Yours faithfully

Stuart Wakefield

Stuart Wakefield
Distributor manager

Material relationships