Trial decision

Invalidation No. 2014-800168

Tokyo, Japan Demandant	MITSUBISHI PENCIL KABUSHIKI KAISHA
Tokyo, Japan Patent Attorney	AOKI, Atsushi
Tokyo, Japan Patent Attorney	SHIMADA, Tetsuro
Tokyo, Japan Patent Attorney	MITSUHASHI, Shinji
Tokyo, Japan Patent Attorney	ITO, Kentaro
Tokyo, Japan Attorney	HAGIO, Yasushige
Tokyo, Japan Attorney	YAMAGUCHI, Kenji
Aichi, Japan Demandee	THE PILOT INK COMPANY, LIMITED
Tokyo, Japan Patent Attorney	KATSUNUMA, Hirohito
Tokyo, Japan Patent Attorney	NAKAMURA, Yukitaka
Tokyo, Japan Patent Attorney	HOTTA, Yukihiro
Tokyo, Japan Patent Attorney	MAEKAWA, Hideaki
Tokyo, Japan Patent Attorney	KASHIWA,Nobuyuki
Tokyo, Japan Attorney	KONDO,Keiji

Tokyo, Japan
Demandee KABUSHIKI KAISHA PILOT CORPORATION

Tokyo, Japan
Patent Attorney KATSUNUMA, Hirohito

Tokyo, Japan
Patent Attorney NAKAMURA, Yukitaka

Tokyo, Japan
Patent Attorney HOTTA, Yukihiro

Tokyo, Japan
Patent Attorney MAEKAWA, Hideaki

Tokyo, Japan
Patent Attorney KASHIWA,Nobuyuki

Tokyo, Japan
Attorney KONDO,Keiji

The case of trial regarding the invalidation of Japanese Patent No. 4961115, titled "REVERSIBLY THERMOCHROMIC WATER-BASED INK COMPOSITION FOR WRITING UTENSIL AND WRITING UTENSIL CONTAINING THE SAME" between the parties above, has resulted in the following trial decision:

Conclusion

The patents regarding the inventions according to Claims 1 to 7 of Japanese Patent No. 4961115 shall be invalidated.

The costs in connection with the trial shall be borne by the demandee.

Reason

No. 1 History of the procedures

The patent application regarding the inventions according to Claims 1 to 7 of the Patent was filed on June 1, 2005, and the patent right was registered on March 30, 2012.

Demandant requested a trial for invalidating the patents granted for the inventions according to Claims 1 to 7 of the Patent on October 16, 2014.

The demandee submitted a written reply on February 16, 2015.

Demandant and Demandee both submitted the first oral proceedings statement briefs on September 3, 2015 and the second oral proceedings statement briefs on September 14, 2015.

The first oral proceeding was on September 17, 2015.

The demandee submitted a written statement on October 1, 2015 according to the first oral proceeding (see "Chief administrative judge 2" of the first oral proceeding record), and in response, the demandant submitted a written statement on October 30, 2015.

The body sent a prior notice of trial decision on December 28, 2015.

No. 2 The inventions of the Patent

The inventions according to Claims 1 to 7 of the Patent should be specified as shown in the following by the matters respectively recited in Claims 1 to 7 of the specification.

Additionally, the inventions according to Claims 1 to 7 of the Patent are respectively referred to as "Invention 1," etc. according to the corresponding claim number. Further, the Inventions 1 to 7 are collectively referred to as "the Invention."

"[Claim 1]

A writing utensil in the form of ballpoint pen, containing a reversibly thermochromic water-based ink composition for writing utensil,

wherein said reversibly thermochromic water-based ink composition for writing utensil comprises at least: a reversibly thermochromic microcapsule pigment that includes a reversibly thermochromic composition consisting of (A) an electron-donating coloring organic compound, (B) an electron-accepting compound, and (C) a reaction solvent that determines the coloring reaction of both; and water, and an average particle size of said reversibly thermochromic microcapsule pigment used herein falls within a range of 0.5 to 2.0 μm, and a particle larger than 4.0 μm accounts for less than 10 vol.% in all microcapsule pigments, and a particle smaller than 2.0 μm accounts for 50 vol.% or more in all microcapsule pigments,

and a frictioning member made of an elastic body is disposed at a part of cap or a part of axis cylinder of said writing utensil.

[Claim 2]

The writing utensil of Claim 1, wherein said reversibly thermochromic microcapsule pigment has a complete achromatic temperature (t4) of 50 to 90°C with respect to a color concentration-temperature curve.

[Claim 3]

The writing utensil of Claim 1 or 2, wherein said reversibly thermochromic microcapsule pigment has a hysteresis width (ΔH) of 40 to 70°C with respect to a color concentration-temperature curve, and a chromogenic temperature (t2) of 0°C or less.

[Claim 4]

The writing utensil of any one of Claims 1 to 3, wherein said reversibly thermochromic microcapsule pigment accounts for 2 to 40 weight% on the total amount basis of said reversibly thermochromic water-based ink composition for writing utensil.

[Claim 5]

The writing utensil of any one of Claims 1 to 4, wherein said reversibly thermochromic water-based ink composition for writing utensil comprises a thixotropy provider.

[Claim 6]

The writing utensil of any one of Claims 1 to 5, wherein a ballpoint pen tip is attached to an edge part for writing, and a ball of said ballpoint pen tip has a diameter of

0.4 to 1.0 mm.

[Claim 7]

The writing utensil of any one of Claims 1 to 6, wherein said frictioning member is made of a rubber, an elastomer or a plastic foam."

No. 3 Reasons for invalidation alleged by the demandant's allegation and Means of proof

Demandant seeks for a trial decision to the effect that "the patent according to Patent No. 4961115 should be invalidated. Cost for trial shall be borne by the Demandee," and submitted the following documentary evidence as a means of proof, and argued that the Patent shall be invalidated under the provision of Article 123(1)(iv) of the Patent Act (Reason 1 and Reason 2), and shall be invalidated under the provision of Article 123(1)(ii) of the Patent Act (Reason 3 and Reason 4).

Reasons 1 and 2 for invalidation are set forth as below:

1 Reason for invalidation 1 (violation of requirements for clarity)

The invention are indefinite, and thus it does not comply with the requirement of Article 36(6)(ii) of the Patent Act, and the patents correspond to the provision of Article 123(1)(iv) of the Patent Act and thus should be invalidated.

2 Reason for invalidation 2 (violation of requirements for support)

The inventions are not described in the Detailed Description of the Invention, and thus the patent application fails to comply with the requirement of Article 36(6)(i) of the Patent Act, and thus the patents correspond to the provision of Article 123(1)(iv) of the Patent Act and thus should be invalidated.

3 Reason for invalidation 3 (lack of novelty)

The inventions according to Claims 1 to 7 of the Patent are identical to inventions that had been publicly worked in Japan or foreign countries before the filing (the body's note: hereinafter referred to as "publicly worked inventions"); specifically, "metamo color illusion (the body's note: hereinafter simply referred to as 'illusion')" that had been sold before the filing (Evidence A No. 2 to Evidence A No. 5), and thus correspond to Article 29(1)(ii) of the Patent Act, and thus the demandee should not be granted a patent for the inventions, but was granted a patent in violation of the provision of the article. Therefore, the patents correspond to Article 123(1)(ii) of the Patent Act, and thus should be invalidated.

4 Reason for invalidation 4 (lack of novelty)

The inventions according to Claims 1 to 7 of the Patent are identical to the inventions described in Evidence A No. 12, and thus these inventions are not patentable under the provision of Article 29(1)(iii) of the Patent Act. Consequently, the patents for these inventions correspond to the invention specified in Article 123(1)(ii) of the Patent Act and thus should be invalidated.

5 Reason for invalidation 5 (lack of inventive step)

A person skilled in the art could have easily conceived of the inventions according to Claims 1 to 7 of the Patent before the patent application on the basis of a publicly worked invention and inventions described in Evidence A No. 12 and well-known commonly used art shown in Evidence A No. 8, and Evidence A No. 13 to Evidence A No. 17, and thus the demandee should not be granted a patent for the inventions under the provision of Article 29(2) of the Patent Act. Consequently, the patents correspond to the provision of Article 123(1)(ii) of the Patent Act and thus should be invalidated.

6 Means of proof

Evidence A No. 1: Japanese Patent No. 4961115

Evidence A No. 2: Test Report (Product configuration) (January 24, 2011)

Evidence A No. 3: Bungu Ryutsu Magazine published on October 27, 2002

Evidence A No. 4: Monthly "BUNGU To JIMUKI", Vol. 79, No. 11, NICHIMA, INC., published on November 15, 2002

Evidence A No. 5: Tokyo District Court Heisei 23-nen (wa) No. 377 Third Brief of The Case of Patent right infringement injunction (Plaintiff) (prepared on November 14, 2011 by the plaintiff: Pilot Corporation)

Evidence A No. 6: Explanation of Illusion

Evidence A No. 7: Written statement (Submission date: April 21, 2010)

Evidence A No. 8: Japanese Unexamined Patent Application Publication No. 2004-148744

Evidence A No. 9: Statement by Atsushi Iwamoto in the position of Deputy Manager of Patent Section of Mitsubishi Pencil Co., Ltd. (September 22, 2014)

Evidence A No. 10: CILAS particle size distribution measurement report (prepared on July 12, 2012)

Evidence A No. 11: Shimadzu SALD-3100 (Measurement day: July 12, 2012)

Evidence A No. 12: Japanese Unexamined Patent Application Publication No. 2005-1369

Evidence A No. 13: Japanese Unexamined Patent Application Publication No. 2000-136339

Evidence A No. 14: Japanese Unexamined Patent Application Publication No. 2001-19888

Evidence A No. 15: Japanese Unexamined Patent Application Publication No. 2003-11574

Evidence A No. 16: Japanese Unexamined Patent Application Publication No. 2003-221543

Evidence A No. 17: Japanese Unexamined Patent Application Publication No. 2003-231855

Evidence A No. 18: Fine Particles Handbook, First Edition, First printing, Asakura Publishing Co., Ltd., published on September 1, 1991

Evidence A No. 19: A web site of NIKKISO CO., LTD., "Fundamental General Discussion of particle size distribution measurement, fundamental theory of light"

Evidence A No. 19-2: A web site of NIKKISO CO., LTD., "What particle diameter is the volume average diameter [MV] in the measurement of particle size distribution?"

Evidence A No. 20: "Search report (search report on the measurement method of particle diameter of ink for writing utensil)" (prepared on May 11, 2011)

Evidence A No. 21: "Expert opinion" (prepared by Jun-ichiro TSUBAKI) (April 23,

2012)
Evidence A No. 22: Practical measurement technique of particle diameter, First edition, First printing, pages 2 to 7, NIKKAN KOGYO SHIMBUN, LTD., October 26, 2001
Evidence A No. 23: Japanese Unexamined Patent Application Publication No. 2003-206432
Evidence A No. 24: Japanese Unexamined Patent Application Publication No. 2001-207101
Evidence A No. 25: "What should be known to use measurement device of particle size distribution - Laser diffraction/scattering type measurement -", FUNTAI GIJUTSU, Vol. 1, No. 6, 2009
Evidence A No. 26: "Measurement technique of particle size distribution from nanometer to centimeter", FUNTAI GIJUTSU, Vol. 1, No. 11, 2009
Evidence A No. 27: "An introductory course of powder for powder technician No. 53, Prep step for introduction-6 Representation of particle size-3", Powder technique, Vol. 6, No. 6, 2014
Evidence A No. 28: "Why is the measurement of particle size distribution so difficult?" Readout HORIBA Technical Reports, No. 4, HORIBA, Ltd., January 1992
Evidence A No. 29: "Fine particle Engineering - Fundamental and Application of dispersion -", Asakura Publishing Co., Ltd., published on June 25, 1994
Evidence A No. 30-1: A pamphlet of "9 Acrylic copolymer colored beads RUBCOULEUR" (Spherical fine particle of acrylic-based polymer of Dainichiseika Color & Chemicals Mfg. Co., Ltd.)
Evidence A No. 30-2: "Summary of measurement results of RUBCOULEUR"
Evidence A No. 30-3-1 to 2: RUBCOULEUR/ Measurement results with HRA-100 of NIKKISO CO., LTD. (measurement date: August 21, 2015)
Evidence A No. 30-4-1 to 3: RUBCOULEUR/ Measurement results with SALD-3100 of SHIMADZU CORPORATION (measurement date: July 15, 2015)
Evidence A No. 30-5-1 to 6: RUBCOULEUR/Measured person: measurement results with LMS-2000e of SEISHIN ENTERPRISE Co., Ltd. (measurement date: July 22, 2015)
Evidence A No. 30-6-1 to 2: RUBCOULEUR/Operator: tokumaru measurement results with CILAS 1064 (Date: July 15, 2015)
Evidence A No. 30-7-1 to 2: RUBCOULEUR/measurement results with LA-300 of HORIBA, Ltd.
Evidence A No. 30-8-1 to 2: RUBCOULEUR/ Measurement results with LA-920 of HORIBA, Ltd.
Evidence A No. 30-9: RUBCOULEUR/measurement results with laser diffraction/scattering-type particle size distribution measurement device LA -950V2 of HORIBA, Ltd.
Evidence A No. 30-10: RUBCOULEUR/measurement results with CAPA-700 of HORIBA, Ltd.
Evidence A No. 30-11: RUBCOULEUR/Measurement results with Multisizer 4 of Beckman Coulter, Inc. (July 27, 2015)
Evidence A No. 31-1: A pamphlet of "Art perl (Registered Trademark)" (spherical crosslinking polymer fine particles of Negami Chemical Industrial Co., Ltd) Ver. 1.05, page 1 (cover page), page 3, page 7, page 21, July 31, 2014
Evidence A No. 31-2: "Summary of measurement results with J-4PY"

Evidence A No. 31-3-1 to 3: J-4PY/ Measurement results with HRA-100 of NIKKISO CO., LTD. (measurement date: August 21, 2015)
Evidence A No. 31-4-1 to 4: J-4PY/ Measurement results with SALD-3100 of SHIMADZU CORPORATION (measurement date: August 25, 2015)
Evidence A No. 31-5-1 to 2: J-4PY/ Measurement results with LMS-2000e of SEISHIN ENTERPRISE Co., Ltd. (measurement date: August 12, 2015)
Evidence A No. 31-6-1 to 3: J-4PY/ Operator: tokumaru Measurement results with CILAS1064 (Date: August 10, 2015)
Evidence A No. 31-7-1 to 4: J-4PY/Measurement results with LA-300 of HORIBA, Ltd.
Evidence A No. 31-8-1 to 4: J-4PY/Measurement results with LA-920 of HORIBA, Ltd.
Evidence A No. 31-9-1 to 2: J-4PY/Measurement results with laser diffraction/scattering-type particle size distribution measurement device LA-950V2 of HORIBA, Ltd.
Evidence A No. 31-10: J-4PY/Measurement results with CAPA-700 of HORIBA, Ltd.
Evidence A No. 31-11: J-4PY/Measurement results with Multisizer 4 of Beckman Coulter, Inc. (August 17, 2015)
Evidence A No. 32: Measurement technique of particle diameter, First edition, First printing, NIKKAN KOGYO SHIMBUN, LTD., November 30, 1994
Evidence A No. 33: A webpage of Beckman Coulter, Inc., "Fundamental knowledge of particle size distribution measurement 6. Principle of particle size distribution measurement", 2011
Evidence A No. 34: "JIS Z 8825-1:2001 (ISO13320-1:1999) Particle diameter analysis-Laser diffractometry-Part 1: Measurement principle", First printing, Japanese Standards Association, June 30, 2001
Evidence A No. 35: "JIS Z 8825:2013, Particle diameter analysis-Laser diffraction scattering method", First printing, Japanese Standards Association, December 20, 2013
Evidence A No. 36: Seiichiro TAKITA Story of developing "Erasable ballpoint pen" over 30 years, First edition, First printing, Shogakukan Inc., April 6, 2015
Evidence A No. 37: Japanese Unexamined Patent Application Publication No. H07-33997
Evidence A No. 38: Japanese Unexamined Patent Application Publication No. H07-179777
Evidence A No. 39: Japanese Unexamined Patent Application Publication No. H07-241388
Evidence A No. 40: Japanese Unexamined Patent Application Publication No. H08-39936
Evidence A No. 41: Japanese Unexamined Patent Application Publication No. 2004-107367
Evidence A No. 42: Japanese Patent Publication No. H04-17154
Evidence A No. 43: Oral proceedings statement brief (Case number: Invalidation No. 2014-800128) (prepared on May 15, 2015 by the demandees of THE PILOT INK COMPANY, LIMITED and PILOT CORPORATION)
Evidence A No. 44: Japanese Unexamined Patent Application Publication No. 2004-148744
Evidence A No. 45: Japanese Unexamined Patent Application Publication No. 2004-151600
Evidence A No. 46: Japanese Unexamined Patent Application Publication No. 2004-

244489
Evidence A No. 47: Japanese Unexamined Patent Application Publication No. 2005-89576
Evidence A No. 48: KAGAKU DAIJITEN 8, reduced edition, first printing, Kyoritsu Publishing Co. Ltd., February 15, 1964
Evidence A No. 10-2: Measurement results of illusion with CILAS (Results of converting data of Evidence A No. 11 by the refractive index of 1.65-00i) (Date: September 9, 2015)
Evidence A No. 22-2: Practical measurement technique of particle diameter, First edition, First printing, pages 73 to 75, NIKKAN KOGYO SHIMBUN, LTD., October 26, 2001
Evidence A No. 30-2-2: "Summary of measurement results of RUBCOULEUR (Additional Edition)"
Evidence A No. 30-3-3: RUBCOULEUR/measurement results with HRA-100 of NIKKISO CO., LTD. (Results of repetitive measurement with a refractive index of 1.65-00i) (Measurement date: September 4, 2015)
Evidence A No. 30-5-7 to 12: RUBCOULEUR/measurement results with LMS-2000e of SEISHIN ENTERPRISE Co., Ltd. (Results of converting each data of Evidence A No. 30-5-1 to 6 by the refractive index of 1.65-00i) (Measurement date: July 22, 2015)
Evidence A No. 30-6-3 to 4: RUBCOULEUR/measurement results with CILAS1064 (Results of converting each data of Evidence A No. 30-6-1 to 2 by the refractive index of 1.65-00i) (Date: September 4, 2015)
Evidence A No. 31-2-2: "Summary of measurement results with J-4PY (Additional Edition)"
Evidence A No. 31-3-4: RUBCOULEUR/measurement results with HRA-100 of NIKKISO CO., LTD. (Results of repetitive measurement with a refractive index of 1.65-00i) (Measurement date: September 4, 2015)
Evidence A No. 31-5-3: J-4PY/measurement results with LMS-2000e of SEISHIN ENTERPRISE Co., Ltd. (Results of converting data of Evidence A No. 31-5-1 by the refractive index of 1.65-00i) (Measurement date: August 12, 2015)
Evidence A No. 31-6-4 to 5: J-4PY/Operator: tokumaru Measurement results with CILAS1064 (Results of converting each data of Evidence A No. 31-6-1 to 2 by the refractive index of 1.65-00i) (Date: September 4, 2015)
Evidence A No. 49: Report "Setting of refractive index in the particle size distribution measurement of laser diffractometry" (October 28, 2011, prepared by an employee of the demandee, THE PILOT INK COMPANY, LIMITED)
Evidence A No. 50: Measurement information
Evidence A No. 51: "[Inquiry] Particle size distribution measurement Refractive index", mail from an employee of Aishin Nano Technologies CO., LTD (August 21, 2015)
Evidence A No. 52: Microtrac (Registered trademark) particle size analyzer "Guideline of input condition in measurement", NIKKISO CO., LTD.
Evidence A No. 53: Report "Setting of refractive index in the particle size distribution measurement by laser diffractometry" (February 22, 2012, prepared by an employee of the demandee, THE PILOT INK COMPANY, LIMITED)
Evidence A No. 54: Report (April 20, 2012, prepared by an employee of the demandant, Mitsubishi Pencil Co., Ltd.)
Evidence A No. 55: Specification of Multisizer 3 (a webpage of Beckman Coulter, Inc.)

(September 8, 2015)
Evidence No. 56: "JIS Z 8827-1:2008, Particle diameter analysis- Image analysis method-Part 1: Static image analysis method", First printing, Japanese Standards Association, March 20, 2008

No. 4 The demandee's allegation and Means of proof

Demandee seeks for the trial decision to the effect that "The trial of the case was groundless. The costs in connection with the trial shall be borne by the demandant," and argued that all of the invalidation Reasons 1 to 5 described in the above items "No. 3, 1" to "No. 3, 5" were groundless, and submitted the following means of proof.

Evidence B No. 1: JASIS2013 New technology explanatory meeting, HORIBA, Ltd., 2013
<URL:http://www.horiba.com/fileadmin/uploads/Scientific/Exhibitions/2013/JASIS2013/NewTechnologyDocument/JASIS2013_PSA_Basis.pdf>
Evidence B No. 2: "Fine particle Engineering - Fundamental and Application of dispersion -", first edition, first printing, pages 63 to 66, Asakura Publishing Co., Ltd., published on June 25, 1994
Evidence B No. 3: Beginner's books 16, Introduction of powder technique, first edition, first printing, pages 20 to 23, Kogyo Chosakai Publishing Co., Ltd., November 15, 2000
Evidence B No. 4: Filler Application Manual, First edition, First printing, pages 40 to 43, TAISEISHA LTD., May 31, 1994
Evidence B No. 5: A page of the website of SHIMADZU CORPORATION, "Practical course: solution to the question about measurement method, Laser diffraction-type particle size distribution measurement device 2 Particle size distribution depending on the measurement principle" (May 24, 2011)
Evidence B No. 6: Test report (microcapsule average particle size measurement) (that measured a particle size of illusion) (January 23, 2015, prepared by an employee of the demandee, PILOT CORPORATION)
Evidence B No. 7: Explanation of measurement device of accurate particle size distribution: Multisizer (Registered trademark) 4e (manufactured by Beckman Coulter, Inc.) (December, 2014)
Evidence B No. 8: Test report (microcapsule average particle size measurement-Coulter method, image analysis method) (August 31, 2015, prepared by an employee of the demandee, PILOT CORPORATION)
Evidence B No. 9: A pamphlet of "Art perl (Registered Trademark)" (spherical crosslinking polymer fine particles of Negami Chemical Industrial Co., Ltd.) Ver. 1.05, page 1 (cover page), page 7, page 21, page 22, July 31, 2014
Evidence B No. 10-1: Average particle size measurement data by Coulter method
Evidence B No. 10-2: Particle size distribution report (Average particle size measurement data by image analysis method) (Measurement date: January 19, 2015)
Evidence B No. 11: "Laser diffraction particle size distribution from nanometer to millimeter", particle size distribution by laser diffractometry: Malvern for particle measurement url:http://www.malvern.com/jp/products/technology/laser-diffraction/

No. 5 Judgment by the body
1 Invalidation Reason 1 (Violation of clarity requirement)

(1) In connection with the reason 1 for invalidation, the demandant presents the following argument:
"The recitation of 'the average particle size of said reversibly thermochromic microcapsule pigments used herein falls within a range of 0.5 to 2.0 μm' in the scope of claims (constituent element C) is indefinite because it is not clear what the average particle size of microcapsule pigments means even if the description of the specification is considered (hereinafter abbreviated)" (Written demand, page 2, "7.(1)I. Column of REASON 1")

"The definition and the measurement method of 'the average particle size' of the matters specifying the invention recited in Claim 1 are indefinite according to the description of the Detailed Description of the Invention. Thus the patent inventions according to Claim 1 and according to Claims 2 to 7 depending therefrom are indefinite, and are not patentable under the provision of Article 36(6)(ii) of the Patent Act. ... (hereinafter abbreviated)" (Written demand, page 10, "7.(3)I. Column of Reason 1")

(2) Article 36(6)(ii) of the Patent Act specifies that "an invention for which a patent is sought should be definite." The spirit is construed as preventing a disadvantageous result of causing an unexpected disadvantage for a third party due to indefinite technical scope of the invention for which a patent is granted if the invention recited in the scope of the claims is indefinite.

Further, the construction of Article 36(6)(ii); i.e., whether or not an invention for which a patent is sought is definite, should be determined from the viewpoint of whether or not the recitation of the Claims is indefinite to the extent that might cause an unexpected disadvantage for a third party by taking into account the recitation of the Claims as well as the description of the specification and drawings attached to the application on the basis of the common technical knowledge as of the filing (as of the priority date when it claims priority benefit).

(3) First, the general technical meaning about "the average particle size" is examined.

Regarding reversibly thermochromic microcapsule pigments (hereinafter simply referred to as "pigments" in some cases), "the average particle size" should be obtained by dividing the sum of "diameters" of all "particles" by the number of "particles." In such case, the value of the "average particle diameter" would vary according to whether the "particle" is regarded as "an individual particle" or "an aggregate of individual particles."

First, when the "particles" are regarded as "individual" ones, this is effective to specify the size (length) of a non-spherical particle such as a partially concaved particle, e.g. a rugby ball-shaped or donut-shaped particle, unlike a spherical-shaped particle with an equal diameter. For example, there is a method of obtaining "maximum outer diameter" and "minimum outer diameter" by any measurement method, and dividing the sum (total) of these diameters by "2." Actually, Japanese Patent No. 4312987 (Japanese Unexamined Patent Application Publication No. 2003-206432) discloses in [0007] that "... the average particle diameter of the microcapsule [(maximum outer diameter+minimum outer diameter)/2] falls within a range of 1 to 3 μm...". Similar description may also be found in Japanese Patent No. 4271401 ([0015], Japanese Unexamined Application Publication No. 2003-253149), Japanese Patent No. 3984509

([0015], Japanese Unexamined Application Publication No. 2004-27047), Japanese Patent No. 3984510 ([0015], Japanese Unexamined Application Publication No. 2004-27048, Japanese Patent No. 4087222 ([0010], Japanese Unexamined Application Publication No. 2004-151600), Japanese Patent No. 4024668 ([0010], Japanese Unexamined Application Publication No. 2004-205568), Japanese Patent No. 4326817 ([0009], and Japanese Unexamined Application Publication No. 2004-244489). At least Demandee as of the filing of the patent application can deduce that "the average particle diameter of the microcapsule [(maximum outer diameter+minimum outer diameter)/2]" is a barometer or a parameter frequently used to specify a size (length) of "individual particles."

Second, when the "particles" are regarded as an "assembly of particles" that assemble the "individual particles," the particle shape to be assumed in the above "individual particles" is similar to the case, and it is recognized that the "assembly of particles" encompasses the embodiments of "assembly of spherical shaped particles," "assembly of non-spherical shaped particles," and "assembly of a mixture of spherical-shaped particles and non-spherical-shaped particles." In any assembly, in order to obtain "average particle diameter" as the "assembly of particles," there is a method of specifying a size (length) of each "individual particle" with any standard, and obtaining the size (length) by any measurement method, and dividing the sum (total) of the size of each "individual particle" by the number of "individual particles," In general, it is impractical and impossible to obtain a respective size (length) of each "individual particle" in "assembly of particles," although it depends on the size of the particle. Thus there are a variety of methods for obtaining the size, as explained in the following academic document.

(4) Definition of "average particle diameter" as an "assembly of particles" from the viewpoint of academic documents

A " 'Fine Particle Handbook', First Edition, First printing, Asakura Publishing Co., Ltd., published on September 1, 1991" (Evidence A No. 18) has the following descriptions:

(A) "2. 2. 1 Particle diameter

When representing a size of a particle, it is important to obtain the following three things. i) How to represent a size of one particle [The way of selecting a representative diameter], ii) How to represent a group of particles, a size of which has a distribution [The way of representing a particle size distribution (->2. 2. 2)] and iii) How to select an average size representing a group of particles [The way of selecting an average particle diameter (->2.2.3)].

There are various ways to represent a size of one particle (in particular a non-spherical particle), and these are referred to as "representative diameters." Table 1 shows major representative diameters. The representative diameter is categorized into two: the one to be determined by a geometric dimension and an equivalent diameter that is replaced with a diameter of sphere equivalent to any physical amount (The body's note: Table 1 (see the following.) shows "major representative diameters and their meanings." The geometric diameter includes directed diameter, Martin diameter, sifted diameter, etc. The equivalent diameter includes projection area circle equivalent diameter, same surface area sphere-equivalent diameter, same volume sphere-equivalent diameter, Stokes diameter, aerodynamic diameter, fluid resistance equivalent diameter, and light scattering diameter.). Further, the representative diameter is frequently referred to simply as a particle diameter or a particle size. In such a case, it is necessary to definitely suggest what kind of representative diameter it is. Representative diameters in Table are elaborated hereinafter according to the necessity of supplemental explanation.

When taking a microscope image and calculating a particle diameter therefrom, directed diameter is frequently used. This is obtained by measuring a dimension of a particle in a certain direction as in a drawing in Table 1, given that the particle is randomly oriented in three dimensions. A needle-like particle or flat particle can never be oriented randomly in three dimensions, but in any case, it gives a certain significant particle diameter. This representative diameter and the following Martin diameter are not significant for one particle, but are effective for statistically treating a plurality of particles.

Martin diameter is obtained by measuring a dimension in a certain direction such as a directed diameter, but is defined as a length of a line by which an area of particle is divided into two as shown in FIGs of Table 1.

Sifted diameter is a particle diameter of particles that are screened between adjacent mesh openings. As for a standard sifter, a diameter of wire and a mesh opening are determined by JIS. ... (Omitted)...

Second, projection area circle equivalent diameter, same surface area equivalent diameter, and same volume sphere-equivalent diameter are all particle diameters with similar meanings. First, projection area circle equivalent diameter is a diameter of a circle with an area equal to the projection area of a particle as shown in Table 1. This corresponds to a particle diameter obtained by a particle diameter measurement method in which a particle diameter is calculated by detecting a shielding light amount when parallel light is irradiated on a particle. Same surface area sphere-equivalent diameter is a diameter of a sphere with the same surface area as that of a particle. Same volume sphere-equivalent diameter is a diameter of a sphere with the same volume as that of a particle, which corresponds to a particle diameter that is measured by an electrically detection band method (-> 3.3.5.c).

Stokes diameter is currently the most commonly used representative diameter, which has the same precipitation rate vt as that of a particle falling in a static fluid by a gravitational force (->3.3.5.e) as well as the diameter of a spherical particle with the same density, and it is represented by the formula in Table 1: In view of such a physical meaning, it can be said to be a representative diameter useful for considering various phenomena of particle moving in a fluid. As can be seen from the formula of Table 1, Stokes diameter may be calculated by measuring a precipitation rate vt given a fluid viscosity and a particle fluid density, and further may be calculated by another particle diameter measurement method called an inertial method (->3.3.5.g). Stokes diameter may be also referred to as same precipitation rate sphere-equivalent diameter.
... (Omitted)...

Fluid resistance equivalent diameter is defined as a diameter of spherical particle with a resistance equivalent to a Stokes fluid resistance received from a fluid of one particle, which corresponds to a particle diameter measured by diffusion method (->3.3.5), Mobility analyzer (->3.3.5.i), photon correlation method (->3.3.5.b), etc.

Light scattering diameter is a particle diameter calculated by an intensity of scattered light from a particle when light is irradiated on one particle. Intensity of this scattered light depends on particle size, shape, refractive index, and wavelength of irradiated light. Thus it is usually represented as a diameter of a polystyrene latex spherical particle with an intensity of scattered light comparable to that from the particle. Specifically, light scattering diameter is an equivalent diameter that is replaced with an intensity of scattered light of a polystyrene latex particle.

As seen above, the representative diameter closely correlates with a particle diameter measurement method. In many cases, measurement method determines the representative diameter.

The representative diameter mentioned above may be applied to a spherical particle and a non-spherical particle, but in the case of a spherical particle, all the representative diameters are equal except for sifting diameter, aerodynamic diameter, and light scattering diameter."

(B) "2. 2. 2 Particle size distribution

Given that the size of individual particles of a certain particle group was measured in one representative diameter (->2.2.1). A particle group with nonuniform measured sizes of individual particles is called polydisperse, whereas a particle group with uniform sizes of particles is called monodisperse. The feature of polydisperse particles are usually represented by a form of a frequency distribution or an integrated distribution - these are collectively referred to as a particle size distribution. When a particle size distribution of one particle group is displayed, it is necessary to definitely suggest a representative diameter and definitely distinguish the kind of standard - by number, length, area, volume (or mass) - by which the amount of particles was measured. This is because particle size distribution differs thereby."

(C) "2. 2. 3 Average particle diameter

When a particle size distribution measured by a certain standard (-> 2.2.2) is provided using a certain representative diameter (-> 2.2.1), given that the number, length, surface area, and mass of a particle group within a certain particle size section $dp \pm \Delta dp/2$ (provided that Δdp is a width of the particle size section) are respectively n, l, s, m ... (Omitted)..., ... (Omitted)... various average particle diameters may be defined as shown in Table 1 [The body's note: Table 1 shows "various average particle diameters and the definition formula." The kinds of the average particle diameter include number average diameter, length average diameter, area average diameter, mass (or volume) average diameter, average area diameter, average volume diameter, balance average diameter, number median diameter, geometric average diameter, mass (or volume) median diameter, and the definition formulas are given.]. ... (Omitted)... The result is shown in FIG. 1. It can be seen from this figure that the average particle diameter vastly differs depending on the way of the definition."

(D) "

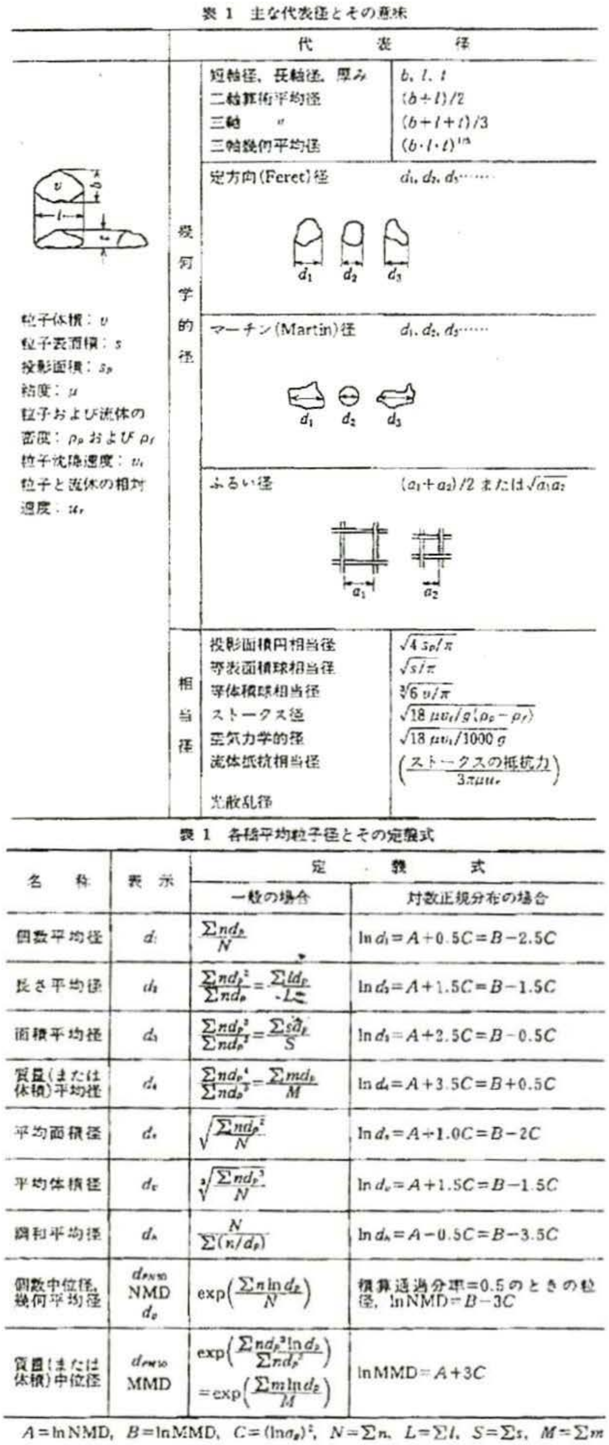


表 1　主な代表径とその意味

		代表径	
粒子体積：v 粒子表面積：s 投影面積：s_p 粘度：μ 粒子および流体の密度：ρ_p および ρ_f 粒子沈降速度：v_t 粒子と流体の相対速度：u_r	幾何学的径	短軸径，長軸径，厚み 二軸算術平均径 三軸 〃 三軸幾何平均径	$b,\ l,\ t$ $(b+l)/2$ $(b+l+t)/3$ $(b\cdot l\cdot t)^{1/3}$
		定方向(Feret)径	$d_1, d_2, d_3 \cdots\cdots$
		マーチン(Martin)径	$d_1, d_2, d_3 \cdots\cdots$
		ふるい径	$(a_1+a_2)/2$ または $\sqrt{a_1 a_2}$
	相当径	投影面積円相当径 等表面積球相当径 等体積球相当径 ストークス径 空気力学的径 流体抵抗相当径 光散乱径	$\sqrt{4 s_p/\pi}$ $\sqrt{s/\pi}$ $\sqrt[3]{6 v/\pi}$ $\sqrt{18 \mu v_t / g(\rho_p-\rho_f)}$ $\sqrt{18 \mu v_t / 1000 g}$ $\left(\frac{\text{ストークスの抵抗力}}{3\pi\mu u_r}\right)$

表 1　各種平均粒子径とその定義式

名称	表示	定義式 一般の場合	定義式 対数正規分布の場合
個数平均径	d_1	$\frac{\Sigma n d_p}{N}$	$\ln d_1 = A+0.5C = B-2.5C$
長さ平均径	d_2	$\frac{\Sigma n d_p^2}{\Sigma n d_p} = \frac{\Sigma l d_p}{L}$	$\ln d_2 = A+1.5C = B-1.5C$
面積平均径	d_3	$\frac{\Sigma n d_p^3}{\Sigma n d_p^2} = \frac{\Sigma s d_p}{S}$	$\ln d_3 = A+2.5C = B-0.5C$
質量(または体積)平均径	d_4	$\frac{\Sigma n d_p^4}{\Sigma n d_p^3} = \frac{\Sigma m d_p}{M}$	$\ln d_4 = A+3.5C = B+0.5C$
平均面積径	d_s	$\sqrt{\frac{\Sigma n d_p^2}{N}}$	$\ln d_s = A+1.0C = B-2C$
平均体積径	d_v	$\sqrt[3]{\frac{\Sigma n d_p^3}{N}}$	$\ln d_v = A+1.5C = B-1.5C$
調和平均径	d_h	$\frac{N}{\Sigma(n/d_p)}$	$\ln d_h = A-0.5C = B-3.5C$
個数中位径，幾何平均径	d_{pN50} NMD d_g	$\exp\left(\frac{\Sigma n \ln d_p}{N}\right)$	積算通過分率=0.5のときの粒径，$\ln \mathrm{NMD} = B-3C$
質量(または体積)中位径	d_{pM50} MMD	$\exp\left(\frac{\Sigma n d_p^3 \ln d_p}{\Sigma n d_p^3}\right) = \exp\left(\frac{\Sigma m \ln d_p}{M}\right)$	$\ln \mathrm{MMD} = A+3C$

$A=\ln \mathrm{NMD},\ B=\ln \mathrm{MMD},\ C=(\ln\sigma_g)^2,\ N=\Sigma n,\ L=\Sigma l,\ S=\Sigma s,\ M=\Sigma m$

表 1　主な代表径とその意味　　Table 1 Major representative diameters and their meanings

粒子体積　　Particle volume

粒子表面積　　Particle surface area

投影面積　　Projection area

粘度　Viscosity

粒子および流体の密度　　Density of particle and fluid
および　and
粒子沈降速度　　Particle precipitating rate
粒子と液体の相対速度　　Relative rate of particle and liquid
代表径　Representative diameter
幾何学的径　　　Geometric diameter
短軸径，長軸径，厚み　　Short axis diameter, long axis diameter, thickness
二軸算術平均系　Biaxial arithmetic average diameter
三軸算術平均系　Triaxial arithmetic average diameter
三軸幾何平均径　Triaxial geometric average diameter
定方向（Ｆｅｒｅｔ）径　Directed (Feret) diameter
マーチン（Ｍａｒｔｉｎ）径　　　Martin diameter
ふるい径　　　　Sifted diameter
（ａ$_1$＋ａ$_2$）／２または√ａ$_1$ａ$_2$　(a1+a2)/2 or √a1a2
相当径　Equivalent diameter
投影面積円相当径　　　　Projection area circle equivalent diameter
等表面積球相当径　　　　Same surface area sphere-equivalent diameter
等体積球相当径　Same volume sphere-equivalent diameter
ストークス径　　Stokes diameter
空気力学的径　　Aerodynamic diameter
流体抵抗相当径　fluid resistance equivalent diameter
光散乱径　　　　Light scattering diameter
ストークスの抵抗力　　　Stokes resistance
表１　各種平均粒子径とその定義式　　　　Table 1 Various average particle sizes and the definition formula
名称　Name
個数平均径　　　Number average diameter
長さ平均径　　　Length average diameter
面積平均径　　　Area average diameter
質量（または体積）平均径　　　　Mass (or volume) average diameter
平均面積径　　　Average area diameter
平均体積径　　　Average volume diameter
調和平均径　　　Balance average diameter
個数中位径，幾何平均径　Number median diameter, geometric average diameter
質量（または体積）中位径　　　　Mass (or volume) median diameter
表示　Indication
定義式　Definition formula
一粒の場合　　　The case of one particle
対数正規分布の場合　　　The case of logarithmic normal distribution
積算通過分率＝０．５のときの粒径，ＩｎＮＭＤ＝Ｂ－３Ｃ　Particle diameter in the case of the integrated passing rate=0.5, lnNMD=B-3C

"

(E) "3.3.2 List of particle size measurement methods

1. Response to light, and sifting method

測定方法		試料状態	測定・検出対象	粒径の物理的意味	原理となる理論	粒度範囲	
画像処理法	マニュアル法	主として乾，液中も	粒子形像（顕微鏡などによる拡大縮少）	二次元的幾何学径	画像計測，画像処理	電顕を用いて3 nm 以上上限無し	直接法．形状など他の特性の観察も可能
	ディジタイザー法						
	自動画像解析法						
光散乱・回折法	光散乱カウンター法	気・液	粒子による光の散乱パターン	光散乱相当径	Mie の光散乱理論	0.1 μm～数 μm	粒子の光学的特性値が必要
	光散乱法	気・液					
	光回折法	気・液	粒子による光の回折パターン	光の回折相当径	Airy の回折理論	1 μm～数百 μm，0.1 μm までの方式もあり	
その他のレスポンス法	X 線散乱法	乾	粒子による X 線の散乱パターン	散乱相当径	Bragg の法則，微小角散乱	数百 nm～1 nm	
	音波の反射吸収法	湿乾	粒子による音波の吸収，反射，散乱など，	散乱相当径		数 μm まで	
	電気的検知帯法	湿（電解質液）	小孔通過時の液の抵抗変化	体積相当径	電導経路の遮断	～数百 nm まで	
ふるい分け法	織網ふるい	乾湿	ふるい目通過量	外接矩形寸法		～約 20 μm	機械的シェーキング法
							ジェット気流法
	電気的成型ふるい					～3 μm	

測定方法　　　Measurement method

画像処理法　　Image processing method

光散乱・回折法　Light scattering/diffractometry

その他のレスポンス法　　Other response method

ふるい分け法　　Screening method

マニュアル法　　Manual method

ディジタイザー法　　　Digitizer method

自動画像解析法　Automatic image analysis method

光散乱カウンター法　　　Light scattering counter method

光散乱法　　　Light scattering method

光回折法　　　Light diffractometry

Ｘ線散乱法　　X-ray scattering method

音波の反射吸収法　　　Reflection absorption method of sound wave

電気的検知帯法　Electrical detection band method

織網ふるい　　Fabric mesh sifter

電気的成型ふるい　　　Electrical mold sifter

試料状態　　　Sample condition

主として乾，液中も　　　Mainly dry, also liquid

気・液　Air / liquid

乾　　Dry

湿乾　Wet Dry

湿（電解質液）　Wet (electrolyte fluid)

乾湿　Dry / Wet
測定・検出対象　Measurement / Detection target
粒子影像（顕微鏡などによる拡大縮少）　Particulate image (magnifying or minified by microscope, etc.)
粒子による光の散乱パターン　Scattering pattern of light by particle
粒子による光の回析パターン　Diffraction pattern of light by particle
粒子によるＸ線の散乱パターン　Scattering pattern of X-ray by particle
粒子による音波の吸収，反射，散乱など　Sound wave absorption, reflection and scattering, etc. by particle
小孔通過時の液の抵抗変化　Resistivity change of liquid when passing a small pore
ふるい目通過量　Mesh passing amount
粒径の物理的意味　Physical meaning of particle diameter
二次元的幾何学径　Two-dimensional geometric diameter
光散乱相当径　Light scattering equivalent diameter
光の回折相当径　Light diffraction equivalent diameter
散乱相当径　Scattering equivalent diameter
体積相当径　Volume equivalent diameter
外接矩形寸法　Circumscribed rectangle dimension
原理となる理論　Underlying theory
画像計測，画像処理　Image Measurement, Image processing
Ｍｉｅの光散乱理論　Mie's light scattering theory
Ａｉｒｙの回折理論　Airy's diffraction theory
Ｂｒａｇｇの法則，微小角散乱　Bragg's law, microangle scattering
電導経路の遮断　Shutdown of electroconductive pathway
粒度範囲　Particle size range
電顕を用いて３ｎｍ以上　上限無し　3 nm or more using electron microscope　No upper limit
０．１μm～数μm　0.1 μm to several μm
１μm～数百μm，　1 μm to several hundreds μm,
０．１μmまでの方式もあり　There is also a type up to 0.1 μm
数百ｎｍ～１ｎｍ　several hundreds nm to 1 nm
数μmまで　Up to several μm
～数百ｎｍまで　Up to several hundreds nm
～約２０μm　Up to about 20 μm
～３μm　Up to 3 μm
直接法，形状など他の特性の観察も可能　Direct method, other properties such as shape may be observed
粒子の光学的特性値が必要　Optical characteristics of particles necessary
機械的シェーキング法　Mechanical shaking method
ジェット気流法　Jet stream method

2. Particle's Behavior in Stream

		測定方法	試料状態	測定・検出対象	粒径の物理的意味	原理となる理論	粒径範囲	
沈降法（重力場および遠心場）	濃度変化測定法	直接測定法（ピペット法）	液	サスペンション濃度	ストークス径（特にその他の *Re* 数範囲の相当径）		重力場ではせいぜい0.5μm位まで。遠心場では原理的には0.1μm以下まで可能。しかし種々の限界。たとえば光を用いる方法は0.1μm位まで	さくからアンドレアゼンピペット，遠心ピペット法もあり
		濁度法（光・X線透過法）	液	光，X線の透過率		(Lambert-Beer の式)		透光係数の粒径補正必要
		比重法（比重計，差圧）	液	サスペンションの比重		流体中の粒子の運動方程式		比重計や浮子を用いる方法，圧力センサーを用いる遠心差圧法も
		個数変化測定法	液，気	サスペンションの個数濃度				全自動画像解析装置と結合
	沈積（積算）重量法	天秤法	液(気)	重量				
		アンバランス法	液	沈降セル中のサスペンションの重心移動				遠心沈降の重心移動を振動検出により
慣性法		加速法	気	粒子の加速度（速度）	ストークス径または空気力学的粒径	LDVによる速度測定	0.5 μm以上	主としてエアロゾル用
		衝突分離法	気	分離粒子の径と重量		気流中の粒子の運動方程式	0.3 μm以上 減圧で0.05 μmまで	カスケードインパクター，減圧で微粒域へ
		慣性スペクトロメーター	気	分級粒子の重量			0.5 μm以上	
		緩和法（spart）	気	粒子-流体間の運動のずれ		（＋LDV測定）	0.2 μm以上	たとえば静電気など外力を用いる。
分離法		ヘリカル管内沈降分離	気	遠心沈降量		気流中の粒子の運動方程式	0.5 μm以上	(Stöber 法)
		多段サイクロン法	液，気	分離粒子重量	同上（分級粒子径）	サイクロンの分離理論	1 μm程度まで	サイクロン1段の場合，多段の場合あり
		モビリティアナライザー	気	静電分離粒子重量	抵抗力相当径	直流電界中の粒子速度	3～5 nmまで	電界強度を変え粒子を分離
拡散法		動的光散乱法	液	レーザー散乱光強度の変動	抵抗力相当径	ブラウン運動＋LDV	5 nmまで	
HDC法		水力学的クロマトグラフィー法	液	クロマトグラフによる分離量	抵抗力相当径	毛管中の粒子移動速度	50 nm付近まで（?）	
FFF法		Field Flow Fractionation法	液(気)	チャネル中の移動速度の差	ストークス径	外力場で沈降させた粒子の流体中の速度	10 nm付近まで（?）	

測定方法　　Measurement method
沈降法（重力場および遠心場）　　Precipitation method (Gravitational field and Centrifugal field)
慣性法　Inertial method
分離法　Separation method
拡散法　Diffusion method
ＨＤＣ法　　HDC method
ＦＦＦ法　　FFF method
濃度変化測定法　Concentration change measurement method
沈積（積算）重量法　　Deposit (Integrated) weight method
直接測定法（ピペット法）　　Direct measurement method (pipette method)
濁度法（光・X線透過法）　　Turbidity method (light/X-ray transmittance method)
比重法（比重計，差圧）　Specific gravity method (densitometer, differential

pressure)
個数変化測定法　Number change measurement method
天秤法　Simple balance method
アンバランス法　Unbalance method
加速法　Acceleration method
衝突分離法　　Impact Separation method
慣性スペクトロメーター　Inertial spectrometer
脈流法　Pulse flow method
ヘリカル管内沈降分離　　Precipitation separation in helical tube
多段サイクロン法　　　Multi-stage cyclone method
モビリティアナライザー　Mobility analyzer
動的光散乱法　　Dynamic light scattering method
水力学的クロマトグラフィー法　　Hydrodynamic chromatography method
Ｆｉｅｌｄ　Ｆｌｏｗ　Ｆｒａｃｔｉｏｎａｔｉｏｎ法　　Field Flow Fractionation method
試料状態　　Sample condition
液　　Liquid
液，気　Liquid, Air
液（気）　　Liquid (Air)
気　　Air
測定・検出対象　Measurement / Detection target
サスペンション濃度　　Suspension concentration
光，Ｘ線の透過率　　　Transmittance of light and X-ray
サスペンションの比重　　Specific gravity of suspension
サスペンションの個数濃度　　　Number concentration of suspension
重量　Weight
沈降セル中のサスペンションの重心移動　　Gravity center movement of suspension in a precipitation cell
粒子の加速度（速度）　　Acceleration of particle (rate)
分離粒子の径と質量　　Diameter and mass of separated particle
分級粒子の重量　Weight of classified particle
粒子ー流体間の運動のずれ　　　Particle - Deviation of motion between fluids
遠心沈降量　　Centrifugal precipitation amount
分離粒子重量　　Separated particle weight
静電分離粒子重量　　　Electrostatic separated particle weight
レーザー散乱光強度の変動　　　Variation of laser scattering light intensity
クロマトグラフによる分離量　　　Separated amount by chromatograph
チャネル中の移動速度の差　　　Difference in moving speed in a channel
粒径の物理的意味　　　Physical meaning of particle diameter
ストークス径（稀にその他のＲε数範囲の相当径）　Stokes diameter (In rare cases, an equivalent diameter within a range of the other R ε number)
ストークス径または空気力学的粒径　　　Stokes diameter or Aerodynamic

particle diameter
同上（分級粒子系）　Same as above (Classified particle system)
抵抗力相当径　Resistance equivalent diameter
ストークス径　Stokes diameter
原理となる理論　Underlying theory
（Ｌａｍｂｅｒｔ－Ｂｅｅｒの式）　(Lambert-Beer's formula)
液体中の粒子の運動方程式　Motion equation of particle in liquid
ＬＤＶによる速度測定　Rate measurement by LDV
気流中の粒子の運動方程式（＋ＬＤＶ測定）　Motion equation of particle in stream (+LDV Measurement)
気流中の粒子の運動方程式　Motion equation of particle in stream
サイクロンの分離理論　Separation theory of cyclone
直流電界中の粒子速度　Particle rate in a direct current particle
ブラウン運動＋ＬＤＶ　Brown motion+LDV
毛管中の粒子移動速度　Particle moving rate in a capillary
外力場で沈積させた粒子の液流中の速度　Rate of a particle in a liquid fluid deposited by an external force
粒径範囲　Particle diameter range
重力場ではせいぜい０．５μm位まで。　At most 0.5 μm or so in a gravity field.
遠心場では原理的には０．１μm以下まで可能。　Possibly 0.1 μm or less in principle in centrifugal field.
しかし種々の限界，たとえば光を用いる方法は０．１μm位まで　Various limits, e.g. a method using light is up to 0.1 μm, and
０．５μm以上　0.5 μm or more
０．３μm以上減圧で０．０５μmまで　0.3 μm or more at a reduced pressure up to 0.05 μm
０．２μm以上　0.2 μm or more
１μm程度まで　1 μm or so
３～５ｎｍまで　3 to 5 nm
５ｎｍまで　Up to 5 nm
５０ｎｍ付近まで（？）　Up to 50 nm (?)
１０ｎｍ付近まで（？）　Up to 10 nm (?)
古くからアンドレアゼンピペット，遠心ピペット法もあり　Since early times, there are also Andreasen pipette and centrifugal pipette
透光係数の粒径補正必要　Calibration of transmittance with particle diameter necessary
比重計や浮子を用いる方法，圧力センサーを用いる遠心差圧法も　Method using a densitometer or a rotameter, as well as centrifugal differential-pressure method using a pressure sensor
全自動画像解析装置と結合　Coupled to Automatic image analysis apparatus
遠心沈降の重心移動を振動検出により　By detecting the movement of gravity center of centrifugal precipitation through vibration
主としてエアロゾル用　Mainly for aerosol use

カスケードインパクター，減圧で微粒埃へ　Cascade impactor, to fine particle dust at a reduced pressure
たとえば静電気など外力を用いる　Using, for example, an external force such as static electricity
（Ｓｔｏｂｅｒ法）　(Stober method)
サイクロン１段の場合、多段の場合あり　Cyclone may be one-stage or multi-stage
電界強度を変え粒子を分解　Particles decomposed with varied electric field intensity"

B " 'Practical measurement technique of particle diameter", First edition, First printing, pages 2 to 7, NIKKAN KOGYO SHIMBUN, LTD., October 26, 2001" (Evidence A No. 22) has the following descriptions:
(A) "1. 2 The way of determining particle size

It is quite difficult to represent particle size in one numerical value. In FIG. 1. 3, sphere particle and cubic particle are exemplified as ideal particles, and limestone is exemplified as a representative of an existing particle. When the size of sphere is asked, you will answer a diameter, whereas the size of cube is asked, most people will answer a length of one side. Then what is the size of limestone? The answer is ??? What differentiates limestone from sphere or cubic? The difference is two. One problem is a shape expression. When it comes to "sphere" and "cubic," everybody assumes the same shape. The shape can be accurately specified. Thus "diameter" and "side" representing the size may also be accurately specified. In contrast, the shape of limestone cannot be expressed in one word.

Another difference is the similarity of shapes. The shape of a human is generally similar. Thus even if the shape cannot be accurately expressed, the size of a human may be represented by body height and body weight. Like a body height or a waist of a human, the barometer representing the size of particle is called a representative particle diameter. Indeed it is recognized that the existing particles have somewhat common feature like a limestone particle of FIG. 1.1 and FIG. 1.3, but they cannot possibly have a similar shape. Therefore, the representative particle diameter is geometrically defined, or defined by use of physical phenomena that is involved with a size of particle. ... ... (Omitted)...

The example of the definition of geometric representative particle diameter includes Feret diameter in which particle image as shown in FIG. 1.4 is sandwiched between parallel lines, or a sifter mesh opening as shown in FIG. 1.5. Further, a diameter of a sphere with the same volume as that of particle as shown in FIG. 1.6 is also well-defined as a representative diameter. Surface area or projection area of particle as well as volume and a diameter of sphere or circle with equal perimeter are also well-defined as a representative diameter. In this way, a diameter of a sphere or circle that has been replaced with any method is called a sphere-equivalent diameter, a circle-equivalent diameter.

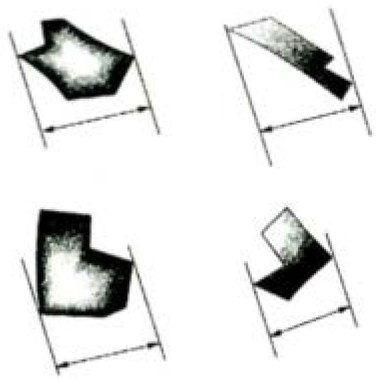
As shown in FIG. 1.7, a diameter of a sphere with the same precipitation rate as a particle (same density as the particle) is also used as a representative diameter, and called a precipitation equivalent diameter or Stokes diameter. Particle diameter to be measured by liquid phase precipitation method represented by a centrifugal precipitation screening method or X-ray screening method is a precipitation-equivalent diameter. As shown in FIG. 1.8, when light is radiated on a particle, the particle scatters light. It is a laser diffraction scattering method that regards a diameter of a sphere with the most similar scattering pattern as a representative particle diameter and has become a mainstream of the current particle size distribution measurement technique.

Such representative particle diameter is defined according to the measurement principle. Thus as in the case of representing a size of human with a body height or a shoulder width, if the representative particle diameter differs, the same particle may have different particle diameters."

(B) "

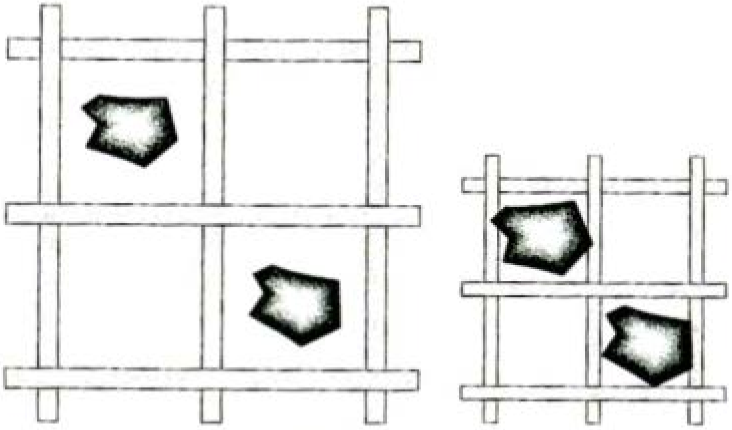
球　立方体　石灰石　　Sphere　Cubic　Limestone

図１．３　粒子の大きさ（球、立方体、石灰石）　FIG. 1.3　Particle size (sphere, cube and limestone)

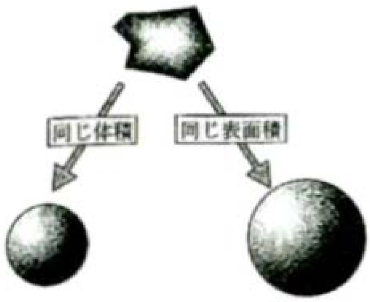


大きさ＝　　Size =
ある定まった平行線の間隔　　Gap between predetermined parallel lines.

図１．４　粒子影像から定義される代表径　FIG. 1. 4　Representative diameter defined from a particle image



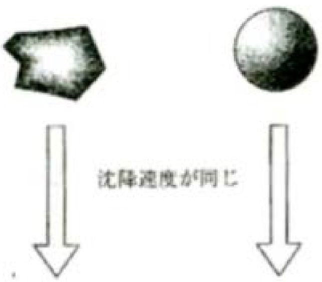
大きさ＝ふるい目開き　　Size = Sifter mesh opening
図１．５　ふるい目開きにより定義される代表径　　FIG. 1. 5　Representative diameter defined by sifter mesh opening



同じ体積　　Same volume
同じ表面積　　Same surface area

大きさ＝幾何学的特徴が同じ球の直径　　Size = Diameter of sphere with the same geometric feature

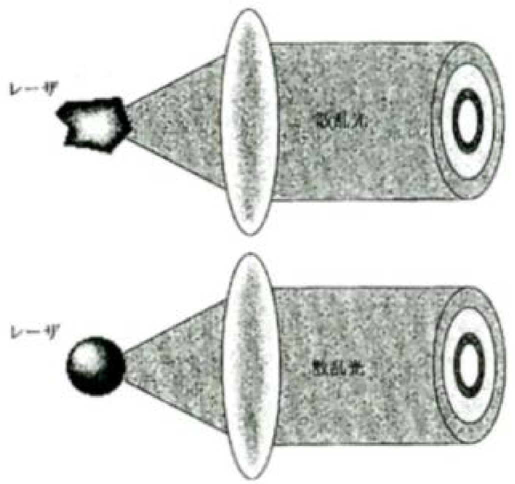
図１．６　体積や表面積などから定義される代表径（体積相当径，表面積相当径）　FIG. 1. 6　Representative diameter defined from volume or surface area (Volume equivalent diameter, surface area-equivalent diameter)



沈降速度が同じ　Same precipitating rate

大きさ＝沈降速度が同じ球の直径　Size = Diameter of sphere with the same precipitating rate

図１．７　沈降相当径　　FIG. 1.7 Precipitation-equivalent diameter



レーザ　Laser
散乱光　Scattered Light

粒子の大きさ＝光の散乱パターンが同じと見なせる球の直径　Size of particle = Diameter of sphere with the same light scattering pattern

図１．８　光の回折現象により定義される代表径　　FIG. 1. 8 Representative diameter defined by diffraction phenomenon of light
"

(5) Summary of meaning of "average particle diameter" in academic document

While, according to the description of the above academic documents, the size of one particle (particle diameter, representative diameter) may be expressed in various ways, the size of one particle belongs to either a geometric diameter or an equivalent diameter (a diameter that is replaced with a diameter of sphere equivalent to any physical amount). Geometric diameter includes undirectional particle diameter, Martin diameter, and sieve opening diameter. Equivalent diameter includes various ones such as projection area circle equivalent diameter, same surface area sphere-equivalent diameter, same volume sphere-equivalent diameter, Stokes diameter, fluid resistance equivalent diameter, light scattering diameter, etc. "Average particle diameter" of "assembly of particles" means average particle diameter (representative diameter) representing "assembly of particles," which includes various average particle diameters such as number average diameter, length average diameter, area average diameter, and volume average diameter and their definitions (calculation method). It differs depending on the calculation method of the representative diameter even if it is the same particle.

Therefore, although Invention 1 specifies that "average particle diameter falls within a range of 0.5 to 2.0 μm," the specific numerical range is shown without concrete definition of average particle size and it is not clear what kind of calculation method is employed. That means, it does not specify the range concretely. Meanwhile, since it is recognized that a particle diameter (representative diameter) is closely related with particle diameter measurement method as is defined according to the measurement principle, particle diameter (representative diameter) can be determined by the measurement method.

Therefore, if the specification defines average particle diameter (calculation method) or the description of the measurement method, it is sufficient to show an average particle diameter falling within a specific numerical range. Accordingly, consideration is given to the description of the specification.

(6) Consideration of the description of the specification

A Regarding "average particle diameter," the Detailed Description of the Invention of the specification has the following descriptions:

(A) "The present invention tries to solve the aforesaid problem. Specifically, it provides a reversibly thermochromic water-based ink composition for writing utensil capable of causes brushstroke to change color by a simple means of frictioning without delaminating or transferring brushstroke, while maintaining definiteness and color concentration, as well as a writing utensil comprising the same." ([Problem to be solved by the Invention], [0003])

(B) "The present invention aims to solve the problem of the aforesaid reversibly thermochromic water-based ink composition for writing utensil, and a writing utensil comprising the same. Specifically provided is a reversibly thermochromic water-based ink composition for writing utensil that at least comprises: a reversibly thermochromic microcapsule pigment that includes a reversibly thermochromic composition consisting of (A) an electron-donating coloring organic compound, (B) an electron-accepting compound, and (C) a reaction solvent that determines the coloring reaction of both; and water, and an average particle size of said reversibly thermochromic microcapsule pigment used herein falls within a range of 0.5 to 2.0 μm, and a particle larger than 4.0 μm is less than 10 vol.% in all microcapsule pigments, and a particle smaller than 2.0 μm is 50 vol% or more in all microcapsule pigments." ([0004])

(C) "Reversibly thermochromic composition consisting of said three-components is used by incorporating into a microcapsule. This is because it might not decrease its function when in contact with chemically active substance or the other solvent component such as acidic substance, basic substance, peroxides, etc., but maintain thermal stability, and the reversibly thermochromic composition can maintain the same composition in various use conditions, and cause a similar function and effect.

Aforesaid microcapsule is practical if the average particle diameter falls within a range of 0.5 to 2.0 μm.

If the average particle diameter exceeds 2.0 μm, the frictioning makes it easier to cause microcapsule pigments to delaminate from brushstroke. On the other hand, a system with 0.5 μm or less is hard to show chromogenicity in high concentration.

Furthermore, particle with a size exceeding 4.0 μm in said microcapsule pigments is less than 10 volume%, preferably less than 7 volume%, more preferably less than 5 volume% in all the microcapsule pigments. Particle with a size below 2.0 μm is 50 volume% or more, preferably 60 volume%, more preferably 70 volume% or more in all the microcapsule pigments.

If particle with a size of 4.0 μm exceeds 10 volume% in the pigments, it tends to compromise ink communication, fade a brushstroke, or fail to form a brushstroke.

Further, if particle with a size of less than 2.0 μm is less than 50 volume% in pigments, particles penetrating into a paper are decreased, whereas particles present on a paper surface are increased. Thus there are many particles separating from a brushstroke by frictioning or transferring into a blank part, thereby failing to maintain definiteness and color concentration of the brushstroke.

Said microcapsule is effective in a range of inclusion/wall membrane=7/1 to 1/1 (weight ratio), and as the ratio of inclusion gets greater than the aforesaid range, it causes a decrease in color concentration and vividness during generating color, preferably inclusion/wall membrane=6/1 to 1/1 (weight ratio),.

Microcapsulation of said reversible thermochromic composition may be implemented by an interfacial polymerization method, interfacial polycondensation method, in situ polymerization method, coacervate method, liquid hardening coating method, phase separation method from aqueous solution, phase separation method from organic solvent, melt dispersion cooling method, gas suspension coating method, spray drying method, etc. and selected as necessary from them. Furthermore, the surface of microcapsule has a secondary resin film to impart resistance according to its purpose, or modified surface properties to serve for practical use.

Said microcapsule pigments may be a form of circular section, or a form of non-circular section." ([0010])

(D) "Example 1

Preparation of reversibly thermochromic microcapsule pigment

A reversibly thermochromic composition with color memory consisting of (A) component of 2.5 parts of 1,3-dimethyl-6-diethylaminofluorane, (B) component of 5.0 parts of 2,2-bis(4'-hydroxyphenyl)hexafluoropropane and 3.0 parts of 1,1-bis(4'-hydroxyphenyl)n-decane, and (C) component of 50.0 parts of 4-benzyloxyphenylethyl caprate was uniformly heated and dissolved, and a solution in which 30.0 parts of a wall film material of aromatic isocyanate prepolymer and 40.0 parts of auxiliary solvent were mixed was subjected to emulsifying dispersion by adjusting a dispersion condition in an 8% polyvinylalcohol aqueous solution so that the average particle diameter may become about 1.8 μm. After about one hour stirring at 70°C, 2.5 parts of aqueous aliphatically-modified amine was added and further stirred for six hours to obtain a reversibly thermochromic microcapsule pigment suspension.

Said suspension is subjected to centrifugal separation to isolate a reversibly thermochromic microcapsule pigment.

Further, said microcapsule pigments (T1: -18°C, T2: -9°C, T3: 45°C, T4: 64°C) underwent color change from orange to achroma, and the average particle diameter was

1.79 μm, particles with a diameter exceeding 4.0 μm was 4.4 volume% in all the microcapsule pigments, and particles with a diameter below 2.0 μm was 60.8 volume% in all the microcapsule pigments.
... (Omitted)...

Color changing behavior of brushstroke

Writing down on a commercial PPC paper with said writing utensil, the characters of "ABCDEF" (brushstroke) was formed.

Aforesaid brushstroke was orange at a room temperature (25°C), and when frictioning the characters of "DEF" with an abrasion member made of SEBS attached to a cylinder axis, the characters of "DEF" lost color.

Subsequently, when the paper was cooled in a freezer at -18°C, the characters of "DEF" generate color again to restore the original brushstroke of "ABCDEF." The orange colors of "ABC" and "DEF" had a similar level of concentration. <u>No peeling of brushstroke</u> or contamination of blank portion of paper <u>by frictioning was observed</u>." ([0023], [0026])

(E) "Example 2

Preparation of reversibly thermochromic microcapsule pigment

A reversibly thermochromic composition with color memory consisting of (A) component of 2.0 parts of 4,5,6,7-tetrachloro-3-[4-(diethylamino)-2-ethoxyphenyl]-3-[4-(diethylamino)-2-methylphenyl]-1(3H)-isobenzofuranone, (B) component of 8.0 parts of 1,1-bis(4'-hydroxyphenyl)n-decane, and (C) component of 50.0 parts of stearyl stearate and 5.0 parts of stearone was uniformly heated and dissolved, and a solution in which 30.0 parts of a wall film material of aromatic isocyanate prepolymer and 40.0 parts of an auxiliary solvent were mixed was subjected to emulsifying dispersion by adjusting a dispersion condition in an 8% polyvinylalcohol aqueous solution so that the <u>average particle diameter may become about 1.6 μm</u>. After about one hour stirring at 70°C, 2.5 parts of aqueous aliphatically-modified amine was added and further stirred for six hours to obtain a reversibly thermochromic microcapsule pigment suspension.

Said suspension was subjected to centrifugal separation to isolate a reversibly thermochromic microcapsule pigment.

In addition, said microcapsule pigments (T1: 43°C, T2: 52°C, T3: 52°C, T4: 45°C, ΔH: 58°C) changed color from turquoise to achroma, and the average particle diameter was 1.56 μm, particles with a diameter exceeding 4.0 μm accounted for 1.8 volume% in all the microcapsule pigments, and particles with a diameter below 2.0 μm accounted for 75.8 volume% in all the microcapsule pigments.
... (Omitted)...

Color changing behavior of brushstroke

Writing down on a commercial PPC paper with said writing utensil, the characters of "AIUEO KAKIKUKEKO" (brushstroke) were formed.

Aforesaid brushstroke was turquoise at room temperature (25°C), and when frictioning the characters of "AIUEO" with an abrasion member made of SEBS attached to a cylinder axis, the characters of "AIUEO" lost color.

When the frictioning was ceased and left for a while, the characters of "AIUEO" naturally generated a color to restore the original brushstroke of "AIUEO KAKIKUKEKO." The turquoise colors of "AIUEO" and "KAKIKUKEKO" had a similar level of concentration. No peeling of brushstroke or contamination of blank portion of paper by frictioning was observed." ([0027], [0030])

(F) "Comparative Example 1

Preparation of reversibly thermochromic microcapsule pigment

In a similar manner to Example 1 except for the change of emulsifying condition, particles having an average particle diameter of 2.93 μm, a diameter exceeding 4.0 μm of 25.4 volume% in all the microcapsule pigments, and a diameter below 2.0 μm of 16.1 volume% in all the microcapsule pigments were prepared.

... (Omitted)...

Color changing behavior of brushstroke

Writing down on a commercial PPC paper with said writing utensil, the characters of "ABCDEF" (brushstroke) were formed.

Aforesaid brushstroke was orange at room temperature (25°C), and when frictioning the characters of "DEF" with an abrasion member made of SEBS attached to a cylinder axis, the characters of "DEF" lost color.

Subsequent cooling of the paper in a freezer at -18°C resulted in the color generation of the characters of "DEF"; however, the characters had a color concentration of 30% compared to the initial stage, and further an orange ink was transferred on a circumference of the characters to contaminate the blank portion. This was supposed that a reversibly thermochromic microcapsule pigment was fallen off a paper surface and transferred when frictioning with a friction member." ([0034], [0037])

(G) "Comparative Example 2

Preparation of reversibly thermochromic microcapsule pigment

In a similar manner to Example 2 except for the change of emulsifying condition, particles having an average particle diameter of 2.47 μm, a diameter exceeding 4.0 μm of 19.3 volume% in all the microcapsule pigments, and a diameter below 2.0 μm of 31.8 volume% in all the microcapsule pigments were prepared.

... (Omitted)...

Color changing behavior of brushstroke

Writing down on a commercial PPC paper with said writing utensil, the characters of "AIUEO KAKIKUKEKO" (brushstroke) were formed. This brushstroke was turquoise at a room temperature (25°C), and when frictioning the characters of "AIUEO" with an abrasion member made of SEBS attached to a cylinder axis, the characters of "AIUEO" lost color.

When the frictioning was ceased and left for a while, the characters of "AIUEO" was naturally generating a color; however, the characters had a lower color concentration compared to the initial stage, and further turquoise ink was transferred on a circumference of the characters to contaminate the blank portion. It was supposed that a reversibly thermochromic microcapsule pigment fell off a paper surface and transferred when frictioning with a friction member." ([0034], [0037])

B The Invention is directed to an invention of "writing utensil," and comprises "reversibly thermochromic water-based ink composition for writing utensil" comprising "reversibly thermochromic microcapsule pigment." Such "reversibly thermochromic microcapsule pigment" "has an average particle diameter of 0.5 to 2.0 μm" as a matter necessary for specifying the invention (hereinafter referred to as "the matter of average particle diameter."

Further, it is recognized that such matter solves the problem described in the point (A) of the above item (6)A, in particular peeling of brushstroke by friction. In this regard, according to the experimental results of Examples 1 and 2 and Comparative Examples 1 and 2 of the point (D) to (G) of the above item (6)A, no peeling of brushstroke by friction was observed in Example 1 with an average particle diameter of about 1.8 μm and Example 2 with an average particle diameter of 1.6 μm, whereas the peel-off of brushstroke by friction (peeling) was observed in Comparative Example 1 with an average particle diameter of 2.93 μm and Comparative Example 2 with an average particle diameter of 2.47 μm.

C Further, the specification only discloses, for example, in Example 1 as a method for preparing particles of reversibly thermochromic microcapsule pigment of the Invention that "A reversibly thermochromic composition with color memory consisting of (A) component of 2.5 parts of 1,3-dimethyl-6-diethylaminofluorane, (B) component of 5.0 parts of 2,2-bis(4'-hydroxyphenyl)hexafluoropropane and 3.0 parts of 1,1-bis(4'-hydroxyphenyl)n-decane, and (C) component of 50.0 parts of 4-benzyloxyphenylethyl caprate was uniformly heated and dissolved, and a solution in which 30.0 parts of a wall film material of aromatic isocyanate prepolymer and 40.0 parts of auxiliary solvent were mixed was subjected to emulsifying dispersion by adjusting a dispersion condition in an 8% polyvinylalcohol aqueous solution so that the average particle diameter may become about 1.8 μm. After about one hour stirring at 70°C, 2.5 parts of aqueous aliphatically-modified amine was added and further stirred for six hours to obtain a reversibly thermochromic microcapsule pigment suspension.

Said suspension is subjected to centrifugal separation to isolate a reversibly thermochromic microcapsule pigment." It fails to disclose a measurement method to be adopted for the measurement of "average particle diameter" of the Invention.

D Further, "a particle larger than 4.0 μm is less than 10 vol.% in all microcapsule pigments, and a particle smaller than 2.0 μm is 50 vol% or more in all microcapsule pigments" of the point (B) of the above item (6)A is a suggestion to see particles as "an assembly of particles," not as "individual particles." Further, it can also be assumed from the above description that the volume of particles is measured as well as the size of the particle. In view of the above "Summary of meaning of 'average particle diameter' on academic documents," the Invention may be construed as "volume average diameter," which is one of "average particle diameter." In this regard, there is no dispute between the demandant and the demandee. (Written demand, page 16, lines 5 from the bottom to the last line, Written reply, page 10, line 3 from the bottom to page 11, line 1)

(7) Accordingly, the consideration is given to the common technical knowledge about "volume average diameter."

According to the above academic documents A and B, "same volume sphere-equivalent diameter" to be calculated by an electrical detection band method (the body's note: also referred to as Coulter Counter Method) is a diameter of a sphere when a particle is replaced with the sphere having the same volume as the particle (geometric characteristics). Further, "light scattering equivalent diameter" to be calculated by a light scattering method is a diameter of the sphere when a particle is replaced with the sphere having the same scattering pattern as the particle (optical properties). Further, "light diffraction equivalent diameter" to be calculated by a light diffractometry is a diameter of a sphere when a particle is replaced with the sphere having the same light diffraction pattern as the particle. Furthermore, "Stokes diameter" to be calculated by a precipitation method is a diameter of a sphere when a particle is replaced with the sphere having the same precipitation rate as the particle (dynamic). It is obvious to a person skilled in the art that "volume average particle diameter" can be calculated by these methods.

It should be noted that they focus on and measure different characteristics to obtain an average particle diameter from a volume average diameter. Therefore, it cannot be asserted that the difference in the measurement method does not cause the difference in the value of average particle diameter.

(8) Further, the body has conducted a search for corresponding portions of patent publications of the patent application as an ex officio trial examination on the basis of the following search strategy as to what kind of method was adopted in the measurement of average particle diameter of pigments contained in an ink for writing utensil by a person skilled in the art as of the filing date (June 1, 2005) of "Japanese Patent No. 4961115" of the Patent (excluding the demandant and the demandee):

[Search strategy]
A Filing date: June 1, 2002 to May 31, 2005
B Applicant: Excluding the demandant and the demandee
C IPC (International Patent Classification): C09D11/16 (Ink for writing utensil); C09D11/18(used for ballpoint pen)
D Full-text search keyword: "average particle diameter" or "average particle size"
E Others: excluding divisional application.

[Search Results]
Company A: Electron microscope method (Japanese Unexamined Patent Application Publication No. 2006-265519, [0008] etc.) Laser light diffraction scattering method (Japanese Unexamined Patent Application Publication No. 2006-206704, [0008], etc.)
Company B: Centrifugal precipitation method (Japanese Unexamined Patent Application Publication No. 2004-197011, [0026], etc.)
Company C: Electron microscope method (Japanese Unexamined Patent Application Publication No. 2005-29766, [0032])
Company D: Laser light diffraction scattering method (Japanese Unexamined Patent Application Publication No. 2004-238502
[0020]), Electron microscope method (Japanese Unexamined Patent Application Publication No. 2004-238502, [0028])
Company E: Centrifugal precipitation method (Japanese Unexamined Patent Application Publication No. 2004-51802, [0080], etc.)

Further, according to the above [Search stragtegy], it is recognized that a person skilled in the art had measured an average particle diameter of particles of pigments used for ink for writing utensil by means of a measurement device utilizing various methods, such as laser diffractometry, centrifugal precipitation method, or electron microscope until the application of the Patent was filed(June 2005); however, it cannot be said that a laser diffractometry measurement has already become a mainstream or a common method for a person skilled in the art, nor can it be said that there was a common technical knowledge that a laser diffractometry measurement had been used without exception.

Underlining “laser diffractometry”, the demandee mentions as follows.
"According to descriptions of the specification and a common technical knowledge, it is reasonable to regard a diameter measured by laser diffractometry for a perfect sphere as a particle diameter in the Invention.”

However, in contrast, in another case, "Third brief (Plaintiff)" submitted on November 14, 2011 by the demandee of PILOT CORPORATION to the Tokyo District Court, 29th division (Tokyo district court, Heisei 23-nen (wa) No. 377, the Patent right infringement injunction case, Plaintiff: PILOT CORPORATION, Defendant: Mitsubishi Pencil Co., Ltd., hereinafter referred to as "Evidence A No. 5") discloses as follows in the column of No. 1.1 "(1) Prosecution history and measurement method of average particle diameter of the A's Patent" on page 2.
"The specification of the A's Patent fails to suggest the measurement method of ‘average particle diameter’ of the constituent element A1B. However, it was a common technical knowledge when the patent application was filed to use a laser diffractometry or centrifugal precipitation method for measurement of an average particle diameter. A person skilled in the art who read the patent specification would usually understand that 'an average particle diameter' is measured by laser diffractometry or centrifugal precipitation method, as is argued in the Plaintiff's first and second brief and also shown in the respective items of Evidence A." (Further, "the A's Patent" of the above description is "Patent No. 4601720," and "as of the parent application" means "as of the filing date of the original application of the A's Patent," and as of October 31, 2002, which has been confirmed in the first oral proceeding by both parties (see "First oral proceeding record"). The argument is inconsistent because it refers to "a centrifugal precipitation method."

Therefore, it cannot be said that the specification describes a specific measurement of an average particle diameter regarding an average particle diameter in the Invention even if common technical knowledge is taken into consideration when the patent application was filed.

(9) Regarding the definiteness of an invention, if the examiner (the collegial body of administrative judge) fails to confirm the sufficiency of the requirement, it is reasonable to construe that it is the applicant (the demandee of the invalidation trial) that should have a burden of establishing the requirement.

(10) Consequently, the Invention does not define how to measure the average particle diameter and as aforementioned it can be asserted that the value of the average particle diameter varies according to measurement method. Therefore, the particles in the

Invention cannot be specified because the measurement method is unclear and the particles are defined according to only the value of the average particle size. As a result, the particles are not clear and the technical scope of the invention for which a patent is sought is indefinite. Accordingly, it can be said as possibly causing an unexpected disadvantage for a third party.

Additionally, the demandee mentions as follows.
“If particles are perfect spheres, a geometric diameter is identical to a particle diameter measured and it is totally unnecessary to define a particle diameter by means of a device using a certain measurement method. When particles are not perfect spheres, to be precise, a particle diameter measured varies according to a measurement method since such particles can be equivalent to perfect spheres with different particle diameters. However, when particles measured are nearly perfect spheres, obtained measurements are identical no matter how the particles are measured. Therefore, even if the measurement method is not specified, it does not cause any unexpected disadvantage to a third party with an unexpected disadvantage. Although there are plural measurement methods, it will not be a ground for lack of clarity requirements. In other words, while an error occurs according to how much different the particles measured are from perfect spheres, "microcapsule pigments" in the Invention are not perfect spheres but almost perfect spheres, as is obvious from its use and function Therefore, without an explanation, particles can be measured by regarding them as perfect spheres. Measurement methods do not matter. Specifically, setting aside whether or not the above measurement method is appropriate for 'microcapsule pigments,' it is reasonable to believe that there may be only a accidental error according to any measurement methods mentioned by the demandant (as is inevitably produced when implemented by a same measurement method)... (Omitted)..." (Written reply, page 13, line 9 from the bottom to page 14, line 10).

However, in contrast, according to the specification shown in the point (C) of the above item (6)A, "the said microcapsule pigments may have a circular cross-section or non-circular cross-section." That is, the microcapsule pigments does not exclude pigments with a non-circular cross-section. Further, regarding Examples 1 and 2 and Comparative Examples 1 and 2 shown in the point (D) to (G) of the above (6)A, there is no reference to the ratio of particles with a circular cross-section to particles with a non-circular cross-section, or to the shape of particles. Therefore, it is impossible to assert that "the microcapsule pigments" in the Invention should be almost perfect spheres as the demandee argues. So, the above demandee's argument cannot be approved.

(11) The application of the Patent does not comply with the requirements under Article 36(6)(ii) of the Patent Act.

No. 6 Closing

As seen above, the recitation in the scope of the claims according to the Invention does not comply with the requirement of Article 36(6)(ii) of the Patent Act. Consequently, the Patent corresponds to the provision of Article 123(1)(iv) of the Patent Act and thus should be invalidated without examining the remaining invalidation reasons.

The costs in connection with the trial shall be borne by demandee under the provisions of Article 61 of the Code of Civil Procedure as applied mutatis mutandis to the provision Article 169(2) of the Patent Act.

Therefore, the trial decision shall be made as described in the conclusion.

June 28, 2016

Chief administrative judge: TOYONAGA, Shigehiro
Administrative judge: KUNISHIMA, Akihiro
Administrative judge: FUJI, Yoshihiro