

CERTIFICATE OF ACCREDITATION

Korea Testing Laboratory

Accreditation No. : KRMPs-011

Corporation Registration No. : 254371-0012187

Address of Reference Material Producer : (Branch site-1) 87, Digital-ro 26-gil, Guro-gu,
Seoul, Republic of Korea
(Branch site-2) 723, Haeon-ro, Sangnok-gu,
Ansan-si, Gyeonggi-do, Republic of Korea

Date of Initial Accreditation : October 26, 2012.

Validity of Accreditation : March 31, 2021. ~ March 30, 2025.

Scope of Accreditation : Attached Annex

Date of issue : January 31, 2024.

This reference material producer is accredited in accordance with the recognized International Standard ISO 17034:2016. This accreditation demonstrates technical competence for a defined scope and the operation of a reference material producer quality management system (refer to Joint ISO-ILAC-IAF Communiqué).



CHIN CHONGWOOK

Head

Korea Laboratory Accreditation Scheme

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Branch site-1 : 87, Digital-ro 26-gil, Guro-gu, Seoul, Republic of Korea

1. Chemical Composition

109. Environmental pollutants

02. Air pollution

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range		Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 109-01-1	Fine dust certified reference material for PAHs	Phenanthrene	100 ~ 5 000	mg/kg	60 %	NIER notice no. 2021-61
			Benzo [b]fluoranthene	1.0 ~ 100		60 %	air pollution test standard -ES 01803.1: 2021
CRM	KTL-CRM 109-01-2	Fine dust certified reference material for heavy metal analysis	Cr	1.0 ~ 100		60 %	NIER notice no. 2021-61 air pollution test standard -ES 01700: 2021
			Ni	1.0 ~ 100		60 %	
			Cd	10 ~ 500		60 %	
			Pb	1.0 ~ 100		60 %	

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3. Engineering characteristics

301. Particle characteristics

01. Particle size, 05. Other

Type of RM (CRM/RM)	(C)RM Code	Name of Material	Certified value or Range		Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
RM	KTL-RM 301-01-1	Colloidal silica reference material for Ultra Pure Water analysis(100nm)	90 ~ 110		nm	10 %	ISO 22412:2017
RM	KTL-RM 301-01-2	Colloidal silica reference material for Ultra Pure Water analysis(500nm)	450 ~ 550		nm	10 %	ISO 22412:2017
RM	KTL-RM 301-02-1	0.4 wt% Single Walled Carbon Nano Tube dispersion reference material	viscosity	250 ~ 330	cP	10 %	ASTM D 2196-15
			solid content	0.90 ~ 1.20	wt%	10 %	KS M ISO 3215
RM	KTL-RM 301-02-2	0.8 wt% Single Walled Carbon Nano Tube dispersion reference material	viscosity	1 300 ~ 1 600	cP	10 %	ASTM D 2196-15
			solid content	1.90 ~ 2.20	wt%	10 %	KS M ISO 3215
RM	KTL-RM 301-02-3	1.0 wt% Single Walled Carbon Nano Tube dispersion reference material	viscosity	2 000 ~ 2 500	cP	10 %	ASTM D 2196-15
			solid content	2.40 ~ 2.70	wt%	10 %	KS M ISO 3215
RM	KTL-RM 301-04-1	Reference materials for particle size and shape analysis (50 μm grade)	particle size	50 ~ 60	μm	10 %	ISO 9276-6:2008
			aspect ratio	0.9 ~ 1.0	-		
			shape analysis	0.9 ~ 1.0			
RM	KTL-RM 301-04-2	Reference materials for particle size and shape analysis (100 μm grade)	particle size	100 ~ 110	μm	10 %	ISO 9276-6:2008
			aspect ratio	0.9 ~ 1.0	-		
			shape analysis	0.9 ~ 1.0			

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Branch site-2 : 723, Haeon-ro, Sangnok-gu, Ansan-si, Gyeonggido, Republic of Korea

1. Chemical Composition

106. Inorganics, Rocks, Ores

06. Ceramics

Type of RM (CRM/RM)	(C)RM Code	Name of Material	Certified value or Range		Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
RM	KTL-RM 106-04-1	Zirconia reference material for chemical analysis	Al	900 ~ 1500	mg/kg	20 %	BS EN 725-12:2001
			Ti	30 ~ 70		20 %	
			Hf	10 000 ~ 20 000		10 %	
			Y	30 000 ~ 50 000		10 %	
RM	KTL-RM 106-04-2	Zirconia reference material for chemical analysis	Ti	20 ~ 60		20 %	BS EN 725-12:2001
			Hf	10 000 ~ 20 000		10 %	
			Y	90 000 ~ 110 000		10 %	
RM	KTL-RM 106-05-1	Yttrium oxide reference material for chemical analysis	Al	5 ~ 30		20 %	KTL L 137-2020A
			Fe	1 ~ 20		20 %	

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1. Chemical Composition

113. High molecular substance

02. High molecular substance additives

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range		Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 113-01-1	ABS certified reference material for bromine-based flame retardant analysis	Decabromo diphenyl ether (BDE-209)	800 ~ 1200	mg/kg	10 %	IEC 6231-6:2015
CRM	KTL-CRM 113-01-2	ABS certified reference material for bromine-based flame retardant analysis	Decabromo diphenyl ether (BDE-209)	90 ~ 140		10 %	IEC 6231-6:2015
RM	KTL-RM 113-02-1	ABS certified reference material for chlorine-based flame retardant analysis	Tris (2-chloroethyl) phosphate (TCEP)	600 ~ 1000		10 %	KS M 1083:2019
RM	KTL-RM 113-02-2	ABS certified reference material for chlorine-based flame retardant analysis	Tris (2-chloroethyl) phosphate (TCEP)	80 ~ 120		10 %	KS M 1083:2019
RM	KTL-RM 113-03-1	High concentration polyethylene reference material for heavy metal analysis	Sn	400 ~ 600		10 %	IEC 62321-5:2013
			Sb	1 500 ~ 2 500			
RM	KTL-RM 113-03-2	Low concentration polyethylene reference material for heavy metal analysis	Sn	50 ~ 200		10 %	IEC 62321-5:2013
			Sb	300 ~ 700			
RM	KTL-RM 113-04-1	Polystyrene reference material for high concentration HBCDD analysis	HBCDD	500 ~ 1500		10 %	IEC62321-9 :2021
RM	KTL-RM 113-04-2	Polystyrene reference material for low concentration HBCDD analysis	HBCDD	50 ~ 150		10 %	IEC62321-9 :2021

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2. Physical properties

201. Ion activity

04. Electrolytic conductivity

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range	Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 201-01-1	Water certified reference material for liquid electrical conductivity(1)	0.5 ~ 1.6	$\mu\text{S/cm}$	0.99	KS I 8001:2009
CRM	KTL-CRM 201-01-2	Water certified reference material for liquid electrical conductivity(5)	2 ~ 8		0.99	KS I 8001:2009
CRM	KTL-CRM 201-01-3	Water certified reference material for liquid electrical conductivity(10)	9 ~ 15		0.99	KS I 8001:2009
CRM	KTL-CRM 201-01-4	Water certified reference material for liquid electrical conductivity(100)	95 ~ 105		4	KS I 8001:2009
CRM	KTL-CRM 201-01-5	Water certified reference material for liquid electrical conductivity (1413)	1400 ~ 1420		8	KS I 8001:2009
CRM	KTL-CRM 201-01-6	Water certified reference material for liquid electrical conductivity (10000)	9 900 ~ 10 100		80	KS I 8001:2009

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2. Physical properties

203. Thermodynamic properties

02. Freezing point & melting point cell

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range	Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 203-01-1	Gallium certified reference material for non-contact temperature measurement	27.8 ~ 31.8	℃	0.4	ASTM E 1256:2017
CRM	KTL-CRM 203-01-2	Indium certified reference material for non-contact temperature measurement	154.6 ~ 159.6		0.4	ASTM E 1256:2017
CRM	KTL-CRM 203-01-3	Tin certified reference material for non-contact temperature measurement	229.9 ~ 233.9		0.4	ASTM E 1256:2017

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2. Physical properties

206. Electrical and magnetic properties

02. Dielectric constant

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range		Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach	
CRM	KIL-CRM 206-01-1	Ceramic/plastic certified reference material for Permittivity measurement	dielectric constant	(100 Hz ~ 10 MHz) 2 ~ 5	-	1.10 % (relative value)	ASTM D150-18 BS 763:1993	
			loss tangent	(100 Hz ~ 10 MHz) 0.000 01 ~ 0.005		232×10 ⁻⁶ (absolute value)		
CRM	KIL-CRM 206-01-2		dielectric constant	(100 Hz ~ 10 MHz) 5 ~ 7		1.56 % (relative value)		
			loss tangent	(100 Hz ~ 10 MHz) 0.000 01 ~ 0.005		160×10 ⁻⁶ (absolute value)		
CRM	KIL-CRM 206-01-3		dielectric constant	(100 Hz ~ 10 MHz) 7 ~ 11		1.97 % (relative value)		
			loss tangent	(100 Hz ~ 10 MHz) 0.000 01 ~ 0.005		378×10 ⁻⁶ (absolute value)		
CRM	KIL-CRM 206-02-1		dielectric constant	(100 Hz ~ 10 MHz) 2 ~ 5		1.29 % (relative value)		
			loss tangent	(100 Hz ~ 10 MHz) 0.000 01 ~ 0.005		154×10 ⁻⁶ (absolute value)		
CRM	KIL-CRM 206-02-2		dielectric constant	(100 Hz ~ 10 MHz) 5 ~ 7		2.00 % (relative value)		
			loss tangent	(100 Hz ~ 10 MHz) 0.000 01 ~ 0.005		158×10 ⁻⁶ (absolute value)		
CRM	KIL-CRM 206-02-3		dielectric constant	(100 Hz ~ 10 MHz) 7 ~ 11		2.79 % (relative value)		
			loss tangent	(100 Hz ~ 10 MHz) 0.000 01 ~ 0.005		163×10 ⁻⁶ (absolute value)		

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2. Physical properties

206. Electrical and magnetic properties

02. Dielectric constant

Type of RM (CRM/VRM)	(C)RM Code	Name of Material	Certified value or Range		Unit	Uncertainties (Confidence Level is about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 206-03-1	Ceramic/plastic certified reference material for Permittivity measurement	Dielectric Constant	(500 MHz ~ 10 GHz) 2 ~ 5	-	0.3	ASTM D7449/D7449M-22
CRM	KTL-CRM 206-03-2		Dielectric Constant	(500 MHz ~ 10 GHz) 5 ~ 7		0.3	
CRM	KTL-CRM 206-03-3		Dielectric Constant	(500 MHz ~ 10 GHz) 7 ~ 11		0.5	
CRM	KTL-CRM 206-04-1		Dielectric Constant	(10 GHz) 2 ~ 5		0.05	IEC 61189-2-721:2015
			Loss Tangent	(10 GHz) 0.000 001 ~ 0.01		1.3×10^{-4}	
CRM	KTL-CRM 206-04-2		Dielectric Constant	(10 GHz) 5 ~ 7		0.06	
			Loss Tangent	(10 GHz) 0.000 001 ~ 0.01		1.3×10^{-4}	
CRM	KTL-CRM 206-04-3		Dielectric Constant	(10 GHz) 7 ~ 11		0.08	
			Loss Tangent	(10 GHz) 0.000 001 ~ 0.01		1.3×10^{-4}	
CRM	KTL-CRM 206-05-1	Dielectric Liquid Certified Reference Materials for Permittivity Measurement	Dielectric Constant	(200 MHz ~ 1.4 GHz) 2 ~ 3	0.2	ASTM D7449/D7449M-22	
			Dielectric Loss	(200 MHz ~ 1.4 GHz) 0.000 1 ~ 0.01	0.1		
CRM	KTL-CRM 206-05-2		Dielectric Constant	(200 MHz ~ 1.4 GHz) 3 ~ 30	0.5		IEC/IEEE 62209-1528 :2020
			Dielectric Loss	(200 MHz ~ 1.4 GHz) 0.000 1 ~ 15	0.4		
CRM	KTL-CRM 206-05-3		Dielectric Constant	(200 MHz ~ 1.4 GHz) 30 ~ 60	2		
			Dielectric Loss	(200 MHz ~ 1.4 GHz) 0.0001 ~ 30	2		
CRM	KTL-CRM 206-05-4		Dielectric Constant	(200 MHz ~ 1.4 GHz) 60 ~ 90	4		
			Dielectric Loss	(200 MHz ~ 1.4 GHz) 0.0001 ~ 10	2		

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2. Physical properties

207. Precision measurement

07. Density

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range	Unit	Uncertainties (Confidence Level about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 207-01-1	Liquid certified reference material for density measurement	0.7	g/cm ³	0.003	KS M ISO 12185:1996
CRM	KTL-CRM 207-01-2		0.8		0.003	
CRM	KTL-CRM 207-01-3		1.0		0.003	
CRM	KTL-CRM 207-01-4		1.2		0.003	
CRM	KTL-CRM 207-01-5		1.3		0.003	
CRM	KTL-CRM 207-01-6		1.6		0.003	
CRM	KTL-CRM 207-02-1	Water certified reference material for sugar content measurement	10	Sucrose in Water (%)	0.05	KS M 0005:2017
CRM	KTL-CRM 207-02-2		12		0.05	
CRM	KTL-CRM 207-02-3		20		0.05	
CRM	KTL-CRM 207-02-4		30		0.05	
CRM	KTL-CRM 207-02-5		40		0.05	
CRM	KTL-CRM 207-02-6		50		0.05	
CRM	KTL-CRM 207-02-7		60		0.05	

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2. Physical properties

207. Precision measurement

08. Liquid viscosity

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range						Unit	Uncertainties (Confidence Level about 95 %, $k = 2$)	Method of Measurement or Approach
			viscosity (mm/s)			viscosity (mPas)					
			20 °C	30 °C	40 °C	20 °C	30 °C	40 °C			
CRM	KTL-CRM 207-03-1	Silicone certified reference material for viscosity measurement	2.0	1.7	1.5	1.8	1.5	1.3	k- viscosity (mm/s) viscosity (mPas)	1.0 %	KSA 051:2016
CRM	KTL-CRM 207-03-2		10	9	7	9	8	7		1.0 %	
CRM	KTL-CRM 207-03-3		50	40	35	48	38	32		1.0 %	
CRM	KTL-CRM 207-03-4		100	80	66	97	78	62		1.0 %	
CRM	KTL-CRM 207-03-5		500	410	320	490	390	320		1.0 %	
CRM	KTL-CRM 207-03-6		1000	780	630	970	770	610		1.0 %	
CRM	KTL-CRM 207-03-7		5000	4000	3100	4800	3800	3000		1.0 %	
CRM	KTL-CRM 207-03-8		10 000	8200	6700	9700	7700	6200		1.0 %	
CRM	KTL-CRM 207-03-9		100 000	80 000	67 000	97 000	77 000	60 000		1.0 %	
CRM	KTL-CRM 207-03-10		300 000	246 000	206 000	291 000	241 000	191 000		1.0 %	

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2. Physical properties

207. Precision measurement

09. Other

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range	Unit	Uncertainties (Confidence Level about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 207-04-1	Microscale certified reference material for microscope calibration	Pitch : 0.9 ~ 1.10	μm	0.04	ISO 11952:2019
			Pitch : 1.90 ~ 2.10		0.06	
			Pitch : 4.8 ~ 5.2		0.2	
			Pitch : 9.7 ~ 10.3		0.3	

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3. Engineering characteristics

301. Particle characteristics

01. Particle size

Type of RM (CRM/IRM)	(C)RM Code	Name of Material	Certified value or Range	Unit	Uncertainties (Confidence Level about 95 %, $k = 2$)	Method of Measurement or Approach
CRM	KTL-CRM 301-01-1	Silver nano-particle certified reference material for particle size analysis	15 ~ 25	nm	25 %	IEC 22412:2017
CRM	KTL-CRM 301-01-2		50 ~ 70		10 %	
CRM	KTL-CRM 301-01-3		95 ~ 125		10 %	

End.