

23/02/2010

計量法トレーサビリティ制度 による標準ガスの供給

Supply of gas standards based
on JCSS (Japan Calibration
Service System)

CERI (Chemicals Evaluation and Research Institute, Japan)

1. Introduction of CERI

2. Summary of JCSS

3. Activity of CERI for JCSS

3.1 Preparation of Primary Reference Materials

3.2 Maintenance of Primary Reference Materials

3.3 Calibration of Secondary Reference Materials

4. New activity

Field

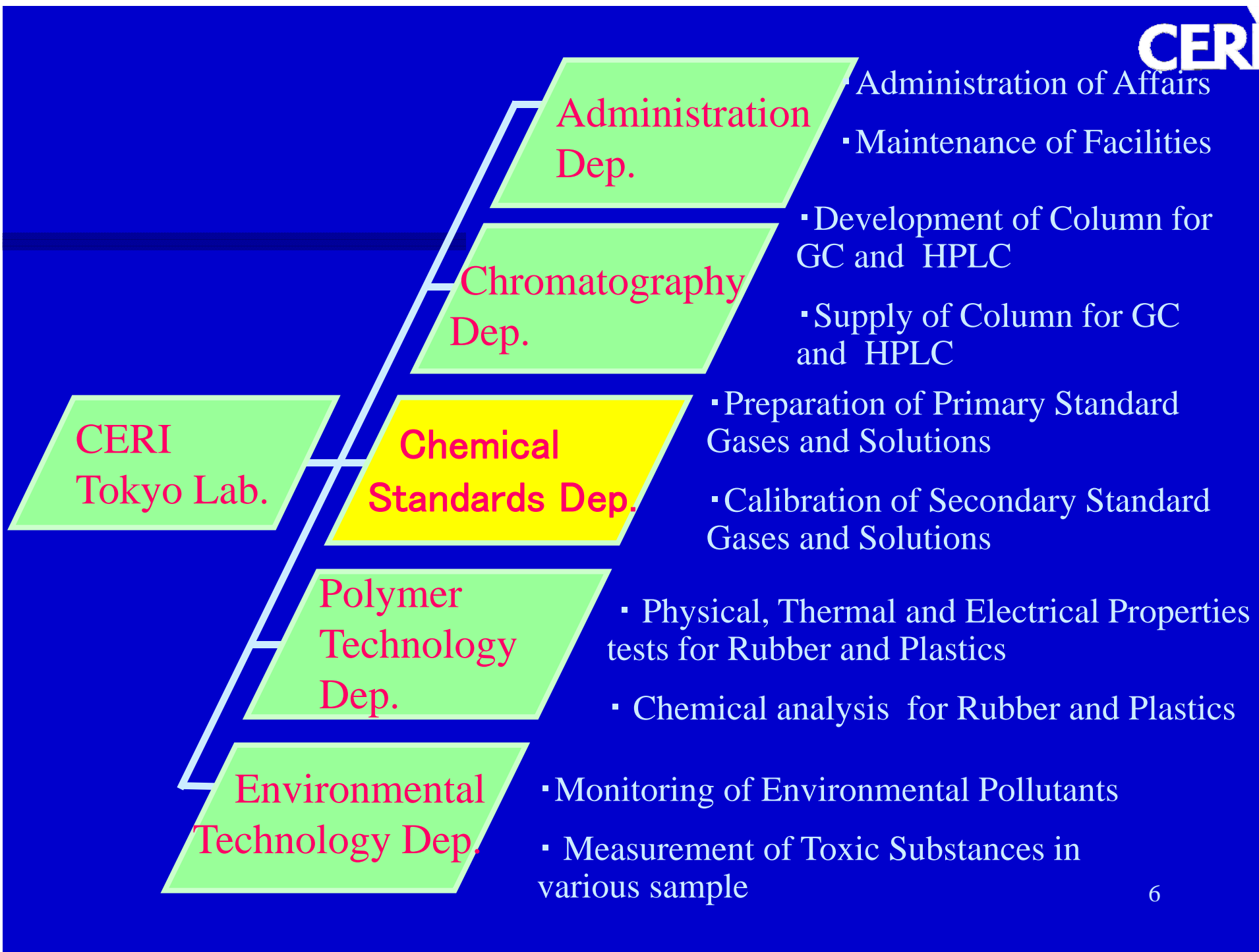
- Polymer Technology (高分子技術部門)
- Environmental Technology
(環境技術部門)
- Chemical Standards (化学標準部門)
- Chemical Biotesting (化学物質安全部門)
- Chromatography (クロマト技術部門)
- Chemicals Assessment and Research
(安全性評価技術研究所)

Outline of activities

- 1. Physical, Thermal and Chemical Tests for Polymer
- 2. Measurement of Environmental Pollutants
- 3. Chemical Analysis of Toxic Substances
- 4. Safety Tests for Chemical Substances
- 5. Ecological Toxicity Tests for Chemical Substances
- 6. Preparation and Maintenance of Primary Reference Materials
- 7. Calibration of Secondary Reference Materials
- 8. Development and Supply of Column for GC and HPLC

Headquarters and Laboratories Location





CERI
Tokyo Lab.

Administration
Dep.

- Administration of Affairs
- Maintenance of Facilities

Chromatography
Dep.

- Development of Column for GC and HPLC
- Supply of Column for GC and HPLC

Chemical
Standards Dep.

- Preparation of Primary Standard Gases and Solutions
- Calibration of Secondary Standard Gases and Solutions

Polymer
Technology
Dep.

- Physical, Thermal and Electrical Properties tests for Rubber and Plastics
- Chemical analysis for Rubber and Plastics

Environmental
Technology Dep.

- Monitoring of Environmental Pollutants
- Measurement of Toxic Substances in various sample

Chemical Standards Department



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Reference Materials supplied on the Measurement Law



Accredited Calibration bodies for gas standards

- Japan Fine Products Corporation
- Sumitomo Seika Chemicals CO.,LTD.
- Takachiho Chemical Industrial CO.,LTD.

PRMs (gas) (2010.2)

1	Carbon monoxide in nitrogen	19	Benzene in nitrogen
2	Carbon dioxide in nitrogen	20	Acetaldehyde in nitrogen
3	Nitrogen monoxide in nitrogen	21	1,3-butadiene in nitrogen
4	Nitrogen monoxide in nitrogen (Low)	22	Acrylonitrile in nitrogen
5	Nitrogen dioxide in air	23	Vinyl chloride in nitrogen
6	Oxygen in nitrogen	24	o-Xylene in nitrogen
7	Oxygen in nitrogen (High)	25	m-Xylene in nitrogen
8	Sulfur dioxide in nitrogen	26	Toluene in nitrogen
9	Sulfur dioxide in air (Low)	27	Ethyl benzene in nitrogen
10	Ammonia in nitrogen	28	Zero gas (nitrogen or air)
11	Methane in air	29	Zero gas for nitrogen oxides (Low)
12	Ethanol in air or nitrogen	30	Zero gas for sulfur oxides (Low)
13	Propane in air or nitrogen	31	Zero gas for VOCs
14	Dichloromethane in nitrogen	32	VOCs 9-mixture in nitrogen (14,15,16,17,18,19,21,22,23)
15	Chloroform in nitrogen	33	VOCs 5-mixture in nitrogen (19,24,25,26,27)
16	1,2-dichloroethane in nitrogen	34	VOCs 12-mixture for Soil pollutants monitoring
17	Trichloroethylene in nitrogen	35	VOCs 7-mixture for Indoor air pollutants monitoring
18	Tetrachloroethylene in nitrogen		

Working gas standards ①

Component	Range	Grade	
		Class 1	Class 2
CH ₄	1 vol ppm ~ 50 vol ppm	±1.0 %	±2.0 %
C ₃ H ₈ (in Air)	3.5 vol ppm ~ 500 vol ppm	±1.0 %	±2.0 %
C ₃ H ₈ (in N ₂)	150 vol ppm ~ 1.5 vol %	±1.0 %	±2.0 %
CO	3 vol ppm ~ 50 vol ppm	±1.5 %	±2.5 %
	50 vol ppm ~ 15 vol %	±1.0 %	±2.0 %
CO ₂	300 vol ppm ~ 16 vol %	±1.0 %	±2.0 %
NO	0.5 vol ppm ~ 1 vol ppm	—	±5.0 %
	1 vol ppm ~ 30 vol ppm	±1.5 %	±2.5 %
	30 vol ppm ~ 5 vol %	±1.0 %	±2.0 %

Working gas standards ②

Component	Range	Grade	
		Class 1	Class 2
NO ₂	5 vol ppm~50 vol ppm	±5.0 %	—
O ₂	1 vol %~25 vol %	±1.0 %	±2.0 %
	98 vol %~100 vol %	±0.1 %	—
SO ₂	0.5 vol ppm~1 vol ppm	—	±5.0 %
	1 vol ppm~50 vol ppm	±1.5 %	±2.5 %
	50 vol ppm~1 vol %	±1.0 %	±2.0 %

Working gas standards ③ (Zero gas)

Type	Quality
For the source of pollution	<ul style="list-style-type: none">< 0.5 vol ppm for CH₄< 1.0 vol ppm for CO< 1.0 vol ppm for CO₂< 0.1 vol ppm for SO₂< 0.1 vol ppm for NO+NO₂
For environment	<ul style="list-style-type: none">< 0.005 vol ppm for SO₂< 0.005 vol ppm for NO+NO₂

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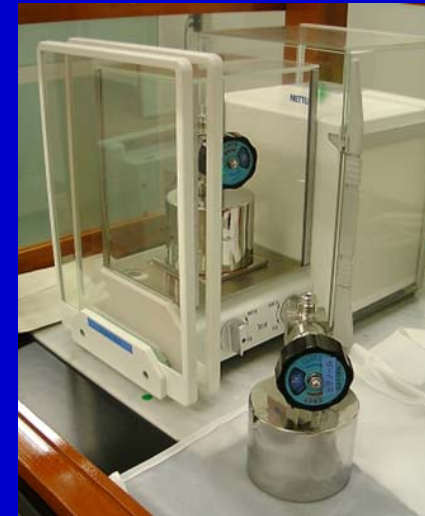
3.3 Calibration of Secondary Reference Materials

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Equipment for preparation



30 kg , 1mg



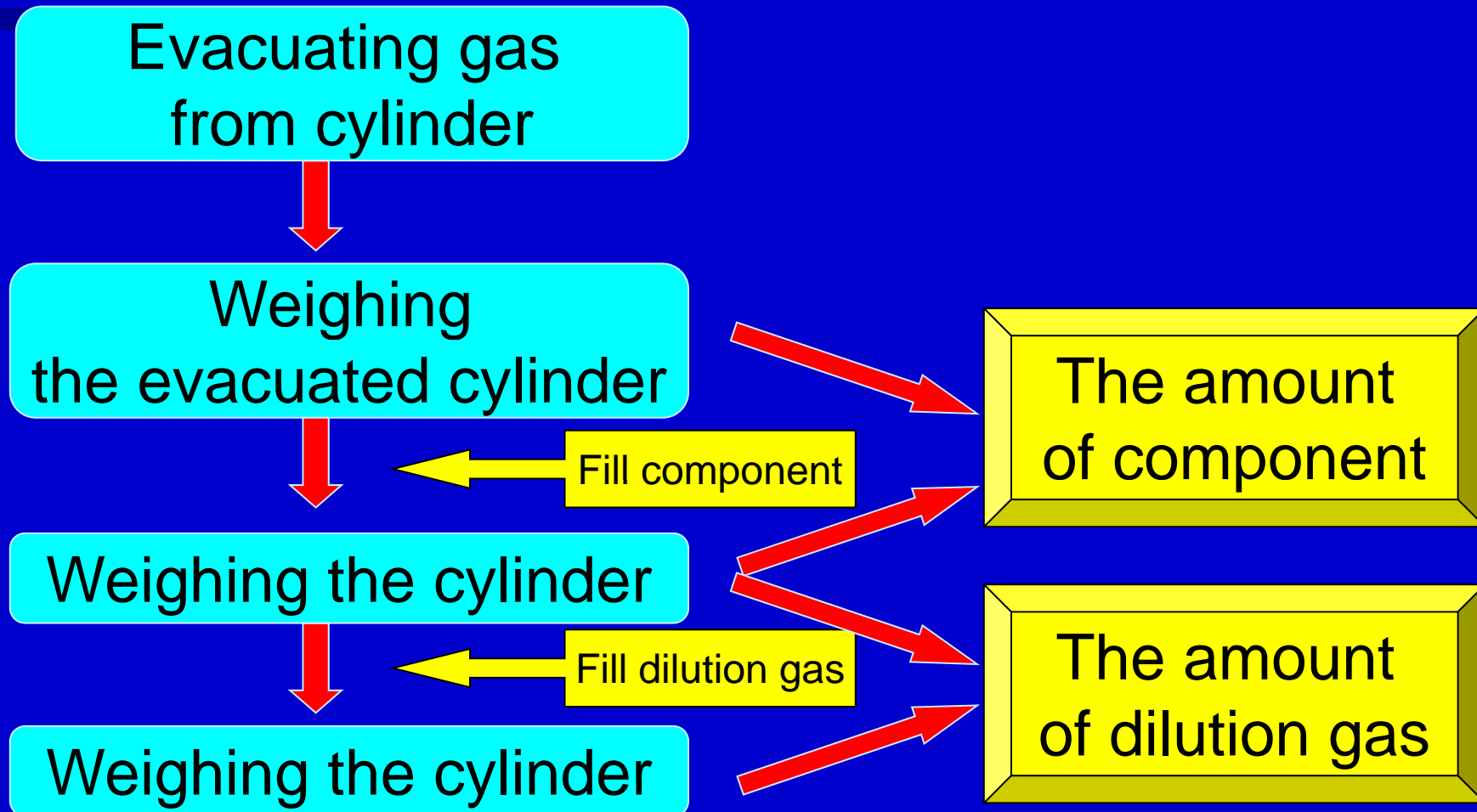
1.1kg , 0.01mg



Preparation system

- Balance
- Manifold

Preparation method



The number of PRMs (gas)

Component	Range	The number
CO	3 vol ppm ~ 15 vol %	46
CO ₂	3 vol ppm ~ 16 vol %	29
NO	0.1 vol ppm ~ 5 vol %	26
NO ₂	5 vol ppm ~ 50 vol ppm	2
O ₂	1 vol % ~ 25 vol %	9
O ₂ (High)	98 vol % ~ 100 vol %	3
SO ₂	0.1 vol ppm ~ 1 vol %	30
CH ₄	1 vol ppm ~ 50 vol ppm	8
C ₃ H ₈ in Air	3.5 vol ppm ~ 500 vol ppm	14
C ₃ H ₈ in N ₂	150 vol ppm ~ 1.5 vol %	14

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Maintenance of PRMs (gas)

- 2-set cylinders (PRMs and spare) to every component for maintenance

Periodic re-preparation using spare cylinders



Comparison between PRMs and new standard



PRMs \Rightarrow spares

New standards \Rightarrow New PRMs

Cycles of preparation

Cycle	Component
1-year	O ₂ , CO (> 1000 vol ppm), CO ₂ , C ₃ H ₈ in N ₂
6-month	CO (≤ 1000 vol ppm), CH ₄ C ₃ H ₈ in air, NO (> 50 vol ppm) SO ₂ (> 50 vol ppm)
3-month	NO (≤ 50 vol ppm) SO ₂ (≤ 50 vol ppm)

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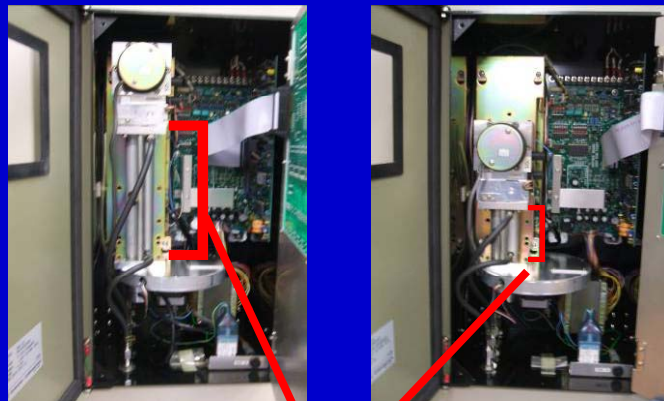
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Equipment for calibration No.1



NDIR



Cell length

	Range
SO ₂ in N ₂	1 vol % ~ 2000 vol ppm
	2000 vol ppm ~ 500 vol ppm
	500 vol ppm ~ 120 vol ppm
	120 vol ppm ~ 20 vol ppm
CO in N ₂	15 vol % ~ 4 vol %
	4 vol % ~ 1 vol %
	1 vol % ~ 2000 vol ppm
	2000 vol ppm ~ 500 vol ppm
CO ₂ in N ₂	500 vol ppm ~ 100 vol ppm
	100 vol ppm ~ 20 vol ppm
	20 vol ppm ~ 3 vol ppm
	16 vol % ~ 4 vol %
NO in N ₂	4 vol % ~ 1 vol %
	1 vol % ~ 2000 vol ppm
	2000 vol ppm ~ 300 vol ppm
	2 vol % ~ 5000 vol ppm

Equipment for calibration No.2



Chemiluminescent



Total hydrocarbon analyzer

	Range
NO in N ₂	5000 vol ppm ~ 1 vol ppm
NO ₂ in Air	
NO in N ₂	1 vol ppm ~ 0.05 vol ppm

	Range
C ₃ H ₈ in Air	500 vol ppm ~ 3.5 vol ppm
C ₃ H ₈ in N ₂	1.5 vol % ~ 300 vol ppm

Equipment for calibration No.3



UV-pulse fluorescence
SO₂ analyzer



Magnetic Oxygen Analyzer

	Range
SO ₂ in N ₂	20 vol ppm ~ 0.05 vol ppm

	Range
O ₂ in N ₂	100 vol % ~ 1 vol %

Equipment for calibration No.4



System GC-FID



GC-FID with methanizer

	Range
CH ₄ in Air	50 vol ppm ~ 1 vol ppm

CO	Used for impurity measurement
CO ₂	Used for impurity measurement

Secondary Reference Materials

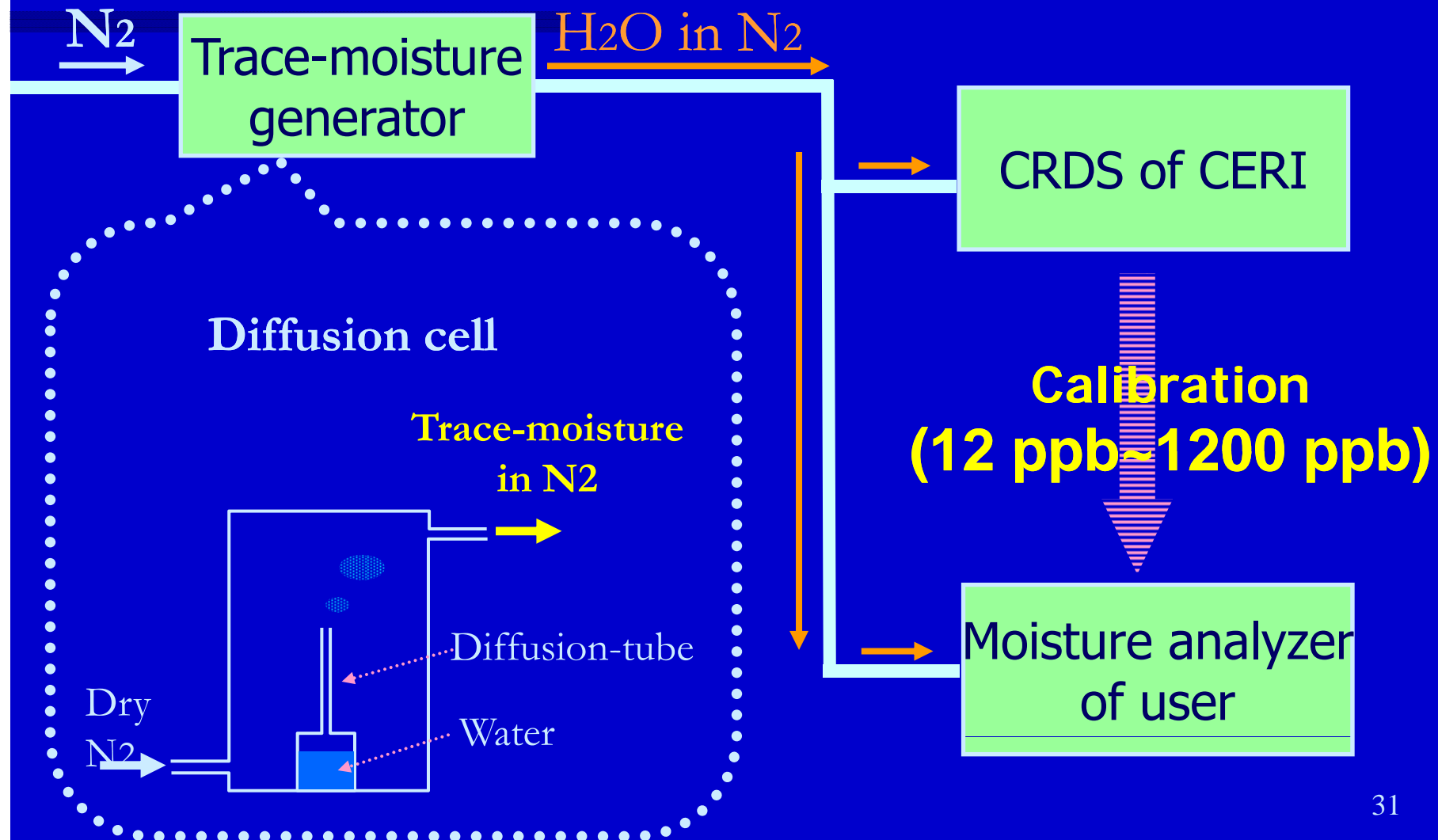
Component	Range	Uncertainty
CO	3 vol ppm ~ 15 vol %	0.30 % ~ 0.50 %
CO ₂	3 vol ppm ~ 16 vol %	0.30 % ~ 0.65 %
NO	0.1 vol ppm ~ 5 vol %	0.40 % ~ 3.50 %
NO ₂	5 vol ppm ~ 50 vol ppm	0.80 % ~ 3.50 %
O ₂	1 vol % ~ 25 vol %	0.15 % ~ 0.20 %
O ₂ (High)	98 vol % ~ 100 vol %	0.05 %
SO ₂	0.1 vol ppm ~ 1 vol %	0.40 % ~ 2.00 %
CH ₄	1 vol ppm ~ 50 vol ppm	0.20 % ~ 0.55 %
C ₃ H ₈ in Air	3.5 vol ppm ~ 500 vol ppm	0.25 % ~ 0.30 %
C ₃ H ₈ in N ₂	150 vol ppm ~ 1.5 vol %	0.25 % ~ 0.35 %

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Traceability to SI for trace moisture analyzer



Calibration system for trace moisture analyzer



Thank you

Chemicals **E**valuation and **R**esearch **I**nstitute, Japan

Home page address : <http://www.cerij.or.jp>