W. Fresenius K. E. Quentin
W. Schneider (Eds.)

Water Analysis

A Practical Guide to Physico-Chemical, Chemical and Microbiological Water Examination and Quality Assurance

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A Practical Guide to Physico-Chemical, Chemical and Microbiological Water Examination and Quality Assurance

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Foreword

1977 saw the publication of "A Collection of Methods for Water Analysis", a three-volume work in ring-binder form compiled by W. Fresenius and W. Schneider for the GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), 6236 Eschborn 1, FRG. This publication was geared to the needs of a project in Algeria.

More recently, the editors were requested by the GTZ to produce, on the basis of the previous collection of the water analysis methods, which was published in French, an updated and revised version to be used in different partner countries and for publication in 1985/86. This was not only to take account of advances in water analysis and instrumental techniques, but also to include simple methods of analysis for use in the field, and methods suitable for use in laboratories with relatively unsophisticated equipment.

The approach envisaged by the GTZ was to divide up information on water, water supplies and water analysis into three broad groups, namely:

1. Simple modules on the physics and chemistry of water, water hygiene and water analysis capable of being understood and applied in practice by the layman using suitable chemicals and equipment (W. Schneider).
2. Information to supplement work by Rump-Krist, also commissioned by the GTZ, on water analysis methods which could be used in laboratories with simple equipment, particularly in the Third World (Verlag Chemie, Weinheim, FRG, 1986).
3. In addition to detailed instructions on sampling methods and on-the-spot analysis of water, the new work, "Water Analysis (A Practical Guide)", was also to provide a concise theoretical presentation of the various techniques of water analysis together with an indication of their relative importance, and to describe methods for use in water analysis laboratories with simple equipment or the latest in modern facilities. It was to include an account not only of up-to-date analysis methods, eg. tests for anthropogenic traces of organic and inorganic substances, but also biological approaches to water analysis. And finally it was to comment on the mathematical evaluation and weighting of the data obtained from water analysis, and to make it possible to arrive at a comparative appraisal of the findings in the light of new guidelines and rules on the quality of wastewater, surface water, ground water, drinking water etc.

One major consideration in this work has been the GTZ's desire to provide its counterparts and their analytical laboratories with summaries of analytical methods which have been tried and tested in practice, and were necessary to give theoretical and practical explanations of these methods, in order to permit laboratories with equipment of varying degrees of sophistication to handle the monitoring of the water quality. Information was also to be included to facilitate appraisal of the significance of analytical findings by comparison with legislation or guidelines from a number of different countries.

The editors and the individual contributors have amassed a broad range of experience of water analysis in virtually every part of the world. The choice of methods for determining the various parameters in water samples is the product of the experience and the results of individual laboratory work in Germany. This book thus embodies not only the author's and editor's practical experience with regard to feasibility of water analyses, but also the experience they have gained during periods of work overseas. Personal experience of the feasibility of the various methods in practice has been a key criterion in the selection of items for inclusion.

In the context of the International Water Decade 1981–1990 the GTZ felt there was a need for a comprehensive contribution of this kind to the field of water analysis and hence to the problem of assuring the quality of water, especially drinking water.

The editors and contributors would like to express their gratitude to Mr. Betz, Mr. Deichsel, Mr. Eichner, Mr. R.E. Fresenius, Mr. Frimmel, Mr. Golwer, Mr. Maushart, Mr. Scholz and Mr. Guckes for their contributions and advice, and to Mrs. Wienrich and Mrs. Bibo for their expert assistance. Our thanks are also due to the typists, Mrs. Wagner and Miss Haas, to Mrs. Fischer and Mrs. Krist for the drawings etc. We should particularly like to thank Mr. Kresse, head of GTZ's "Water Supply and Sanitation" Section, as well as Mrs. Zeumer and Mrs. Tazir of the GTZ Translation Service and the translators involved in producting the English text. Special thanks also go to Mr. T. Oliver for monitoring the English text and Mrs. M. Masson-Scheurer for the final type-script.

The editors and contributors hope that this work, "Water Analysis (A Practical Guide)", will provide water analysts in responsible positions with a valuable guide to assist them in their task of training staff to carry out local inspections and take samples, performing both simple and advanced analysis and assessing the significance and implications of analytical findings. If the book comes anywhere near achieving this ambitious purpose, it will be endorsement enough of its claim to have been produced by practitioners for practitioners.

Constructive criticism from colleagues is always welcome.

We should like to conclude with the hope that future water analysts, not to mention water technologists, will find this book useful in their studies at technical institutions and universities, especially in those countries involved in cooperation with the Federal Republic of Germany.

W. Fresenius
K.E. Quentin
W. Schneider

Preface

This GTZ publication, "Water Analysis (A Practical Guide to Physico-Chemical, Chemical and Microbiological Water Examination and Quality Assurance)", belongs to the wide range of publications for the water sector within the scope of the International Decade for Drinking Water Supply and Sanitation.

The publication responds to the requirements for information and further training in the Federal Republic of Germany's partner countries in technical cooperation projects. It reflects the experience gathered in projects for monitoring and improving water quality, e.g. through establishing national environmental laboratories and water works laboratories for monitoring drinking water quality.

In the growing concern for our environment, maintaining water quality standards and protecting natural water resources have assumed key significance, particularly in newly industrialising countries and Third World conurbations.

Excessive strains on the environment, such as intensive farming, industry and centres of high population density, rapidly inflict serious damage both on the ecological balance and – a fact which often fails to be acknowledged due to a lack of monitoring methods – on human beings.

This publication provides those engaged in monitoring and environmental laboratories, waterworks laboratories and also in research and teaching with reliable and recognized techniques of day-to-day analysis and assessment, in order to develop sound monitoring systems and effective measures for protecting and improving water quality.

The GTZ wishes to thank the authors – in particular Prof. W. Schneider for his untiring efforts – and also the translators, and hopes that "Water Analysis" will be disseminated throughout the world.

Eschborn, September 1987

Dr. Ing. Klaus Erbel
Head of Division
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Water Resources Development"

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Table of Contents

1	**Introduction, Sampling, Local Testing, etc.**	1
1.1	General	1
1.1.1	Water resources	1
1.1.2	Water management	3
1.1.3	Water analyses	3
1.2	Local inspection and sampling of water	5
1.2.1	Sampling of water	5
1.2.2	Local investigations	5
1.2.3	Geology and Hydrogeology	6
1.2.4	Technical information on the water resource	7
1.2.5	Possibilities of environmental influences on the water resource	8
1.2.6	Hygienic considerations	8
1.3	Techniques of water sampling	8
1.3.1	General	8
1.3.2	Bottle material	9
1.3.3	Techniques of sampling	10
1.4	Water sampling in practice	14
1.4.1	Local investigations	14
1.4.2	Sampling for microbiological analysis of water	14
1.4.3	Sampling for physico-chemical analyses	14
1.4.4	Sampling for chemical analyses (see also 1.3)	15
1.4.5	Water sampling for gas analyses	15
1.4.6	Radioactive inert gases	16
1.5	Special instructions for sampling water of various origins and for various investigation purposes	17
1.5.1	Surface water	17
1.5.2	Ground water	17
1.5.3	Salt water	18
1.5.4	Bathing water	18
1.5.5	Industrial water	19
1.5.6	Irrigation	19
1.5.7	Expanses of water devoted to fish cultivation	21
1.5.8	Waste water	21
1.5.9	Sludge	23

1.6	Local investigations (see also 1.7)	24
1.6.1	Preservation of water samples	25
1.6.2	Inorganic substances contained in the water	26
1.6.3	Organic substances contained in the water	27
1.6.4	Radioactivity	27
1.7	Local analyses (see also 1.6)	28
1.7.1	Sensory examination on site	28
1.7.2	Colouring	30
1.7.3	Transparency and turbidity	31
1.7.4	Temperature	32
1.7.5	Hydrogen-ion activity (pH) (cf. also Chapter 2)	32
1.7.6	Electrical conductivity	35
1.7.7	Redox potential	39
1.7.8	Oxygen (cf. also Section 3.6)	42
1.7.9	Ozone	46
1.7.10	Chlorine	49
1.7.11	Determination of chlorine dioxide (ClO_2) and chlorite (ClO_2^-)	51
1.7.12	Carbon dioxide (CO_2), titrimetric determining process on site (cf. also Section 3.6)	57
1.7.13	p- and m-values (acid-base consumption, HCO_3- and CO_3^{2-})	57
1.7.14	Corrosive carbonic acid	58
1.7.15	Settleable substances	61
1.7.16	The investigation of wastes and sludges in the context of water pollution	62
1.7.17	The importance of site inspections for biological assessment of water resources (cf. also Section 1.2, 1.4 and 1.5 above)	66

2	**Theoretical Introduction to Selected Methods of Water Analysis (Classic and Instrumental Methods)**	71
2.1	Concentration processes such as evaporation, distillation, precipitation, coprecipitation, adsorption, ion exchange and extraction	71
2.1.1	Evaporation	71
2.1.2	Distillation	72
2.1.3	Precipitation	72
2.1.4	Coprecipitation	73
2.1.5	Adsorption and ion exchange	73
2.1.6	Extraction	73
2.1.7	Volumetric analysis	74
2.2	Electrochemical processes of analysis	74
2.2.1	Introduction	74
2.2.2	Coulometry	76
2.2.3	Potentiometry	79
2.2.3.1	Ion-sensitive electrodes	82
2.2.4	Polarography	84

2.3	Spectrophotometry (or photometry)	89
2.3.1	Measurable variables of light absorption	90
2.3.2	The Lambert-Beer Law	91
2.3.3	Design and mode of operation of an absorption spectrophotometer	93
2.3.4	Photoelectric photometers	94
2.3.5	Evaluation	95
2.4	Flame-emission spectrophotometry (FES)	98
2.4.1	Design of the instrument	98
2.4.2	Evaluation	100
2.5	Emission spectrum analysis	101
2.6	X-ray Fluorescence Analysis	102
2.7	Atomic Absorption Spectrometry (AAS)	103
2.7.1	Design of the equipment	104
2.7.2	Scope	105
2.7.3	General aspects of calibration and analysis	107
2.7.4	AAS measurements using the graphite furnace technique	108
2.7.5	Example of an AAS measuring system after Perkin-Elmer	109
2.8	Atomic Emission Spectrometry with Inductively Coupled Plasma Excitation (ICP-AES)	110
2.8.1	General	110
2.8.2	Equipment	112
2.8.3	Analytical limits	114
2.9	Fluorescence Spectrometry	115
2.9.1	Equipment	116
2.9.2	Interference	117
2.10	Infrared Spectroscopy	117
2.10.1	General remarks	117
2.10.2	Evaluation of an IR spectrum	120
2.10.3	Preparation and handling of the samples	123
2.11	Chromatographic methods	127
2.11.1	General	127
2.11.2	The main chromatographic techniques used in water analysis	128
2.11.3	General comments on GC-MS techniques in water analysis	128
2.12	Introduction to gas chromatography	134
2.12.1	Principles and definition of the method	134
2.12.2	Structure of gas-chromatographic apparatus	135
2.12.3	Identification of sample components	137
2.12.4	Determination of sample concentrations	137
2.12.5	Sensitivity	138
2.12.6	Speed of analysis and automation	138

2.12.7 Theory of the chromatographic process . . . 138
2.12.8 The separation process . . . 140
2.12.9 General remarks on the formation of the peak shape . . . 141
2.12.10 The partition isotherms . . . 142
2.12.11 Causes of peak broadening . . . 143
2.12.12 The van Deemter equation . . . 147
2.12.13 The number of theoretical plates . . . 148
2.12.14 The efficiency or selectivity of the liquid phase . . . 149
2.12.15 The resolution equation . . . 150
2.12.16 General remarks on GC detectors . . . 152
2.12.16.1 Flame ionization detector (FID) . . . 153
2.12.16.2 Electron capture detector (ECD) . . . 153
2.12.16.3 Thermionic detector (TSB) and alkali flame ionization detector (AFID) . . . 156
2.12.16.4 Flame-photometric detector (FPD) . . . 157
2.12.16.5 Thermal conductivity detector . . . 158
2.12.16.6 Microcoulometric detector . . . 158
2.12.16.7 Mass-selective detector . . . 159
2.12.17 Theoretical considerations regarding detectors . . . 159
2.12.17.1 General remarks . . . 159
2.12.17.2 Characteristic parameters of detectors . . . 163

2.13 Gas-chromatographic headspace analysis (cf. also Chapter 4) . . . 166
2.13.1 General remarks . . . 166
2.13.2 Area of application . . . 167

2.14 High-performance liquid chromatography (HPLC) . . . 168
2.14.1 Basic principles . . . 168
2.14.2 Retention . . . 169
2.14.3 Separation mechanisms . . . 171

2.15 Ion chromatography . . . 172
2.15.1 Ion chromatographs with suppressor . . . 174
2.15.2 Ion chromatography without suppressor . . . 176
2.15.3 Anion separation . . . 177
2.15.4 Examples . . . 177

2.16 Radiochemical analysis of water samples (Introduction) . . . 181
2.16.1 General information . . . 181
2.16.2 Types of radiation . . . 181
2.16.3 Radionuclides in water . . . 182
2.16.4 Units of measurement . . . 183
2.16.5 Radioactive decay . . . 184
2.16.6 Enrichment of radionuclides . . . 184
2.16.7 Measuring preparations . . . 185
2.16.8 Total determination . . . 185
2.16.9 Safety regulations . . . 186
2.16.10 Radiation protection . . . 187
2.16.11 Detectors and measuring equipment . . . 187

2.17 Enzymatic Analysis . . . 194

3	**Inorganic Parameters**	195
3.1	Total parameters	195
3.1.1	Turbidity measurements (see also Section 1.7.5)	195
3.1.2	Density	197
3.1.3	Total determination of dissolved and undissolved substances	199
3.1.3.1	Undissolved substances	201
3.1.3.2	Cumulative determination of dissolved substances with cation exchangers	202
3.1.4	Sulphide sulphur (H_2S, HS^-, S^{2-}) (see also Chapter 1 and Section 3.6)	204
3.1.4.1	Iodometric determination of sulphide sulphur	204
3.1.4.2	Spectrophotometric analysis of sulphide sulphur as methylene blue	205
3.1.5	Water "hardness" (see also Chapter 1, and Sections 3.2 and 3.3)	210
3.2	Anions	211
3.2.1	Fluoride	211
3.2.1.1	Spectrophotometric determination with lanthanum alizarin complexone, directly or following steam acid distillation	211
3.2.1.2	Determination of the fluoride ion with an ion-selective (ion-sensitive) electrode	215
3.2.1.3	Ion chromatography determination of fluoride ions (see Section 3.2.11)	217
3.2.2	Chloride	217
3.2.2.1	Gravimetric determination	218
3.2.2.2	Volumetric determination with silver nitrate (electometric indication)	219
3.2.2.3	Volumetric determination with silver nitrate and potassium chromate (visual indication)	221
3.2.2.4	Ion chromatography determination (see Section 3.2.11)	223
3.2.3	Bromide and iodide	223
3.2.3.1	Consecutive iodometric determination of bromide and iodide in one solution	223
3.2.3.2	Ion chromatography (see Section 3.2.11)	226
3.2.4	Nitrite	226
3.2.4.1	Spectrophotometric analysis with sulphanilic acid and l-naphthylamine	226
3.2.4.2	Ion chromatography (see Section 3.2.11)	229
3.2.5	Nitrate	229
3.2.5.1	Spectrophotometric analysis with sodium salicylate	229
3.2.5.2	Nitrate with 2,6-dimethylphenol	230
3.2.5.3	Determination of nitrate after reductive distillation	231
3.2.5.4	Ion chromatography (see Section 3.2.11)	233
3.2.6	Sulphite	233
3.2.6.1	Iodometric determination of sulphite	233
3.2.6.2	Gravimetric determination as barium sulphate after distillation	234
3.2.6.3	Polarographic determination of sulphite (including sulphide and thiosulphate)	236
3.2.7	Sulphate	237
3.2.7.1	Gravimetric Determination as Barium Sulphate	237
3.2.7.2	Nephelometric Determination of Sulphate	238
3.2.7.3	Ion chromatography (see Section 3.2.11)	239
3.2.8	Phosphate	239

3.2.8.1	Orthophosphate (calculated as hydrogen phosphate)	240
3.2.8.2	Sum of orthophosphate and hydrolyzable phosphorus compounds	243
3.2.8.3	Total phosphorus	245
3.2.8.4	Phosphate determination using ion chromatography (see Section 3.2.11)	247
3.2.8.5	ICP-AES (see Section 3.3.12)	247
3.2.9	Carbonic acid, hydrogen carbonate and carbonate (see also Chapter 1 and Section 3.6)	247
3.2.9.1	Acid consumption (alkalinity)	249
3.2.9.2	Acid consumption and base consumption (p and m value)	250
3.2.9.3	Acidimetric determination of carbonate ions and hydrogen carbonate ions (p and m values)	251
3.2.9.4	Base comsumption (acidity)	254
3.2.10	Total carbon dioxide (see also 3.6, carbon dioxide)	255
3.2.10.1	Calculation of S_c (diss. CO_2) from the p and m value	256
3.2.10.2	Volumetric determination after distillation	257
3.2.10.3	Gravimetric determination after distillation	260
3.2.11	Ion Chromatography of seven anions	264
3.3	Cations	274
3.3.1	Lithium	274
3.3.1.1	Determination by flame photometry	274
3.3.1.2	Direct determination of lithium by means of atomic-absorption analysis	275
3.3.1.3	Lithium determination with the graphite tube technique (Furnace method)	276
3.3.2	Sodium	276
3.3.2.1	Flame photometry	277
3.3.2.2	Direct determination of sodium by means of atomic-absorption analysis	279
3.3.2.3	ICP-AES (see Section 3.3.12)	279
3.3.3	Potassium	280
3.3.3.1	Determination by flame photometry	280
3.3.3.2	Direct determination of potassium by means of atomic-absorption analysis	280
3.3.3.3	ICP-AES (see Section 3.3.12)	281
3.3.4	Rubidium and caesium	281
3.3.4.1	Determination by flame photometry	281
3.3.4.2	Determination of rubidium and caesium in water samples by means of AAS	284
3.3.4.3	Direct determination of rubidium by means of atomic-absorption analysis	285
3.3.4.4	Direct determination of caesium by means of atomic-absorption analysis	286
3.3.4.5	Basis of the method of concentration	286
3.3.5	Ammonium (ammonia)	287
3.3.5.1	Photometric determination of NH_4^+ as indophenol	287
3.3.5.2	Acidimetric determination of NH_4^+ or NH_3 after distillation	290
3.3.6	Magnesium	292
3.3.6.1	Direct determination of magnesium by means of atomic-absorption analysis	293
3.3.6.2	Complexometric analysis (see Calcium, Section 3.3.7)	293
3.3.6.3	ICP-AES (see Section 3.3.12)	293
3.3.7	Calcium	293
3.3.7.1	Direct determination of calcium by means of atomic-absorption analysis	294
3.3.7.2	Chelatometric determination of calcium ions and magnesium ions	294
3.3.7.3	ICP-AES (see Section 3.3.12)	298

3.3.8	Strontium	298
3.3.8.1	Direct determination by means of atomic-absorption analysis	298
3.3.8.2	Determination by flame photometry	299
3.3.8.3	ICP-AES (see Section 3.3.12)	300
3.3.9	Barium	301
3.3.9.1	Direct determination of barium by means of atomic-absorption analysis	301
3.3.9.2	Method of enrichment of barium	301
3.3.9.3	Barium determination with the graphite tube technique (Furnace method)	303
3.3.9.4	ICP-AES (see Section 3.3.12)	303
3.3.10	Iron	303
3.3.10.1	Direct determination of iron by means of atomic-absorption analysis	304
3.3.10.2	Iron determination with the graphite tube technique (Furnace method)	305
3.3.10.3	Spectrophotometric determination of iron (II) ions with 2,2'-bipyridyl (Fresenius-Schneider)	305
3.3.10.4	Spectrophotometric determination of total iron with 2,2'-bipyridyl	307
3.3.10.5	Spectrophotometric determination of total iron with thioglycolic acid	308
3.3.10.6	ICP-AES (see Section 3.3.12)	309
3.3.11	Manganese	309
3.3.11.1	Direct determination of manganese by means of atomic-absorption analysis	309
3.3.11.2	Manganese determination with the graphite tube technique (Furnace method)	310
3.3.11.3	Spectrophotometric determination as permanganate following oxidation by peroxodisulphate	310
3.3.11.4	ICP-AES (see Section 3.3.12)	313
3.3.12	Atomic-emission spectrometry with inductively coupled plasma (ICP-AES, see also Chapter 2)	313
3.4	Trace substances (inorganic) (For ICP-AES determination of 24 elements see Section 3.3.12)	325
3.4.1	Trace detection of elements in parallel by emission spectrography survey analysis (see also Chapter 2)	325
3.4.1.1	Concentration by trace precipitation	325
3.4.1.2	Concentration by extraction	327
3.4.2	Aluminium	328
3.4.2.1	Direct determination by means of atomic-absorption analysis	329
3.4.2.2	Aluminium determination with the graphite tube technique (Furnace method)	330
3.4.2.3	Spectrophotometric determination with eriochromcyanine R	331
3.4.3	Arsenic	333
3.4.3.1	Determination of arsenic using the hydride AAS technique	333
3.4.3.2	Spectrophotometric determination of total arsenic with silver diethyl dithiocarbamate	336
3.4.3.3	Iodometric determination of arsenic (III)	338
3.4.3.4	Separating arsenic (III) and arsenic (V)	340
3.4.4	Antimony	340
3.4.4.1	Determination of antimony using the hydride AAS technique	340
3.4.4.2	Spectrophotometric determination with rhodamine B	342
3.4.5	Beryllium	345

3.4.5.1 Direct determination by means of atomic-absorption analysis 345
3.4.5.2 Basis of the method of concentration 346
3.4.5.3 Beryllium determination with the graphite tube technique (Furnace method) 347
3.4.5.4 Spectrophotometric determination using chromazurol S 347
3.4.6 Lead 349
3.4.6.1 Spectrophotometric determination of lead with dithizone 350
3.4.6.2 Direct determination by means of atomic-absorption analysis 352
3.4.6.3 Basis of the method of concentration 353
3.4.6.4 Lead determination with the graphite tube technique (Furnace method) . . . 354
3.4.6.5 ICP-AES see Section 3.3.12 354
3.4.7 Cadmium 354
3.4.7.1 Direct determination by means of atomic-absorption analysis 355
3.4.7.2 Cadmium determination with the graphite tube technique (Furnace method) 355
3.4.7.3 Spectrophotometric determination of cadmium with dithizone 356
3.4.7.4 ICP-AES see Section 3.3.12 358
3.4.8 Chromium 359
3.4.8.1 Direct determination by means of atomic-absorption analysis 359
3.4.8.2 Total chromium 360
3.4.8.3 Determination of hexavalent chromium 361
3.4.8.4 Chromium determination with the graphite tube technique (Furnace method) 361
3.4.8.5 Photometric determination of total chromium using diphenyl carbazide . . . 362
3.4.8.6 ICP-AES (see Section 3.3.12) 366
3.4.9 Germanium 366
3.4.9.1 Determination of germanium by emission spectrography 366
3.4.9.2 Determination of germanium using graphite-tube AAS technique 367
3.4.10 Cobalt 368
3.4.10.1 Spectrophotometric determination as thiocyanate/tetraphenyl arsonium complex 368
3.4.10.2 Direct determination of cobalt by means of atomic-absorption flame analysis 370
3.4.10.3 Cobalt determination with the graphite tube technique (Furnace method) . . 371
3.4.10.4 ICP-AES see Section 3.3.12 371
3.4.11 Copper 371
3.4.11.1 Direct determination by means of atomic-absorption flame analysis 372
3.4.11.2 Copper determination with the graphite-tube technique (Furnace method) . 372
3.4.11.3 Spectrophotometric determination using NaDDTC 373
3.4.11.4 ICP-AES see Section 3.3.12 375
3.4.12 Molybdenum 375
3.4.12.1 Spectrophotometric determination as a molybdenum (V) thiocyanate complex 375
3.4.12.2 Direct determination of molybdenum by means of atomic-absorption flame analysis 378
3.4.12.3 Principle of the method of extractive concentration 379
3.4.12.4 ICP-AES see Section 3.3.12 379
3.4.13 Nickel 380