Appendix 1. Concentration of standard sulfur dioxide vs absorbance by aniline method using 2% glycerol in 0.05 N NaOH as absorbent

Standard SO_2 $\mu g/cm^3$	Absorbance, 242 nm
0.09	0.004
0.18	0.004
0.22	0.009
0.37	0.007
0.45	0.020
0.63	0.018
0.81	0.047
1.35	0.048
1.80	0.064
2.25	0.070
2.70	0.080
3.60	0.100
4.50	0.112
5.40	0.132
6.30	0.160

Appendix 2. Concentration of standard sulfur dioxide vs absorbance by aniline method using buffered formaldehyde solution as absorbent

No.	Standard SO_2 $\mu g/cm^3$	Absorbance, 242 nm
1	0.08	0.001
	0.13	0.001
	0.17	0.001
	0.21	0.002
	0.25	0.005
	0.34	0.009
	0.38	0.015
	0.51	0.022
	0.76	0.040
	1.06	0.051
	1.28	0.069
	1.49	0.080
	1.62	0.089
	1.91	0.096
	2.13	0.099
	2.34	0.104
2	0.34	0.011
	0.68	0.045
	1.02	0.060
	1.36	0.086
	1.70	0.090
	2.04	0.097

Appendix 2. continued

No.	Standard SO_2 $\mu g/cm^3$	Absorbance, 242 nm
2	2.72	0.124
	2.72	0.124
	3.40	0.161
	4.08	0.180
	4.76	0.223
	5.44	0.265
	6.12	0.301

Appendix 3 . Absorbance of aniline methyl sulfonate after standing at various times

Time (minutes)	Absorbance, 242 nm		
	0.37 μg/cm^3 SO_2	0.48 μg/cm^3 SO_2	1.36 μg/cm^3 SO_2
1	0.017	0.017	0.039
2	0.016	0.020	0.040
3	0.014	0.022	0.043
4	0.012	0.022	0.041
5	0.014	0.025	0.042
6	0.013	0.023	0.045
7	0.014	0.020	0.040
8	0.014	0.022	0.042
9	0.017	0.025	0.045
10	0.019	0.025	0.048
11	0.017	0.028	0.050
12	0.018	0.026	0.048
13	0.019	0.027	0.044
14	0.016	0.027	0.046
15	0.017	0.027	0.044
16	0.015	0.024	0.048
17	0.016	0.024	0.044
18	0.015	0.025	0.048
19	0.015	0.026	0.045
20	0.017	0.025	0.048
21	0.013	0.021	0.045
22	0.016	0.025	0.044
23	0.014	0.022	0.041
24	0.011	0.019	0.038
25	0.011	0.020	0.041
26	0.011	0.020	0.043
27	0.008	0.016	0.045
28	0.009	0.018	0.044
29	0.008	0.018	0.041
30	0.014	0.022	0.040
31	0.009	0.016	0.030

Appendix 3. Continued

Time (minutes)	Absorbance, 242 nm		
	0.37 $\mu g/cm^3$ SO_2	0.48 $\mu g/cm^3$ SO_2	1.36 $\mu g/cm^3$ SO_2
32	0.009	0.019	0.040
33	0.010	0.013	0.040
34	0.010	0.017	0.042
35	0.010	0.017	0.038
36	0.013	0.019	0.040
37	0.009	0.010	0.042
38	0.007	0.016	0.038
39	0.009	0.019	0.040
40	0.010	0.015	0.042
41	0.005	0.014	0.037
42	0.007	0.010	0.042
43	0.008	0.013	0.038
44	0.005	0.014	0.033
45	0.006	0.012	0.037
46	0.010	0.012	0.039
47	0.009	0.012	0.037
48	0.006	0.010	0.033
49	0.005	0.008	0.035
50	0.007	0.010	0.030

BIBLIOGRAPHY

1. วงศ์พันธ์ สิมปเสนีย์ นิตยา มหาผล และ ธีระ เกรอต. มลภาวะอากาศ. พิมพ์ครั้งที่ 1. หน้า 9 สำนักพิมพ์ จุฬาลงกรณ์มหาวิทยาลัย, 2525

2. Mc Carrol, J. and Bradley, W. "Excess Mortality as an Indicator of Health Effects of Air Pollution" Am.J. Public Health 56, (1966) : 1933-1942.

3. Lawther, P.J. "Compliance with the Clean Air Act : Medical Aspects" J. Inst. Fuel (London) 36, (1963) : 341-344.

4. Brasser, L.J., Joosting, P.E. and Van Zuilen, D., "Sulfur Dioxide-To What Level Is It Acceptable ?" Research Institute for Public Health Engineering, Report G-300, Delft, Netherlands, July 1967.

5. Carnow, B.W., Lepper, M.H., Shekelle, R.B. and Stamler, J., "The Chicago Air Pollution Study : SO_2 Levels and Acute Illness in Patients with Chronic Bronchopalmonary Disease." Arch. Environ.Health 18, (1969) : 768-776.

6. Lawther, P.J. "Climate, Air Pollution and Chronic Bronchitis" Proc. Roy. Soc. Med. 51, (1958) : 262-264.

7. Petrilli, R.L., Agnese, G. and Kanitz, S., "Epidemiology Studies of Air Pollution Effects in Genoa, Italy" Arch.Environ. Health 12, (1966) : 733-740.

8. Lunn, J.E., Knowelden, J. and Handyside, A.J., "Patterns of Respiratory Illness in Sheffield Infanct School Children " Brit. J. Prevent. Soc. Med. 21, (1967) : 7-16.

9. Wicken, A.J. and Buck, S.F. "Report on a Study of Environmental Factors Associate with Lung Cancer and Bronchitis Mortality in Areas of North East England" Tobacco Research Council, Research Paper 8, 1964.

10. Firket, J. "Fog Along the Meuse Valley" Trans. Faraday Soc. 32, (1936) : 1192-1197.

11. Schrenk, H.H., Hieman, H., Clayton, G.D., Gafafer, W.M. and Wexler, H., "Air Pollution in Donora, Pa." Public Health Service Bull. p. 306, 1949.

12. Wilkins, E.T. "Air Pollution Aspects of the London Fog of December 1952" Roy Meteorol. Soc. J. 80, (1954) : 267-271.

13. Glasser, M., Greenburg, L. and Field, F. "Mortality and Morbidity During a Period of High Levels of Air Pollution" Arch. Environ, Health 15, (1967) : 684-694.

14. Watanabe, H. "Air Pollution and its Health Effects in Osaka, Japan" Preprint, Presented at the 58th Annual Meeting of the Air Pollution Control Association, Ioronto, Canada, pp. 20-24, June, 1965.

15. Upham, J.B. "Atmospheric Corrosion Studies in two Metropolitan Areas" J. Air Pollution Control Association 17 (1967) : 398-402.

16. Linzon, S.N. "The influence of Smelter Fumes on the Growth of White Pine in the Sudburg Region" Forest Biol. Div., Contribution No. 439, Dept. of Agriculture , Ottawa, Canada, 1958.

17. Katz, M. and Mc. Callum, A.W. The Effect of Sulfur Dioxide on Conifers. Air Pollution, (Mc Cabe, L.C. ed.) pp. 84-96, 1952.

18. Menser, H.A. and Heggestad, H.E. "Ozone and Sulfur Dioxide Synergism : Injury to Tobacco Plants" Science 153, (1966) : 424-425.

19. Bushteuva, K.A. "The Determination of the limit of Allowable Concentration of Sulfuric Acid in Atmospheric Air.", appeared in Limits of Allowable Concentrations of Atmospheric Pollutants. Book 3. (1957) : 20-36. (Eng. trans. Levine, B.S., U.S.Dept. of Commerce, Office of Technical Services,Washington, D.C.).

20. Katz, M. "Photoelectric Determination of Atmospheric Sulfur Dioxide" Anal. Chem. 22 (8), (1950) : 1040-1046.

21. Thomas, M.D. "An Automatic Apparatus for Determination of Small Concentration of Sulfur Dioxide in Air" Ind. Eng. Chem., Anal. Ed., 4, (1932) : 253-256.

22. Wilsdon, B.H. and Mc Connell, F.J. "The Measurement of Atmospheric Sulfur Pollution by Means of Lead Peroxide" J. Soc. Chem. Ind. 21, (1934) : 75-80.

23. Steigman, A. "Acid-Bleached Fuchsin Solution as Analytical Reagent" Anal. Chem. 22, (1950) : 492.

24. Grant, W.M. "Colorimetric Determination of Sulfur Dioxide" Anal. Chem. 19 (2), (1947) : 345-346.

25. Urone, P.F. and Boggs, W.E. "Acid-Bleached Fuchsin in Determination of Sulfur Dioxide in the Atmosphere" Anal. Chem. 23 (10), (1951) : 1517-1519.

26. Patterson, G.D., Jr. and Mellon, M.G. "Determination of Sulfur Dioxide by Color-Changing Gels" Anal. Chem. 24 (10), (1952): 1586-1590.

27. Atkin, S. "Determination of Sulfur Dioxide in Presence of Sulfur Trioxide" Anal. Chem. 22 (7) , (1950) : 947-948.

28. Tioh, N.H. "The Analytical Chemistry of Sulphur." Doctor's Thesis, Otago University, 1976.

29. West P. W. and Gaeke, G.C., "Fixation of Sulfur Dioxide as Disulfitomercurate (II) and Subsequent Colorimetric Estimation" Anal. Chem. 28 (12), (1956) : 1816-1819.

30. Jacobs, M.B. and Greenburg, L. "Sulfur Dioxide in New York City Atmosphere" Ind. Eng. Chem. 48, (1956) : 1517.

31. Vogel, A.I. A Textbook of Practical Organic Chemistry, 3 rd ed., p. 552, Longmans, New York, 1965.

32. Public Health Service Publication No. 1619 "Air Quality Criteria for Sulfur Oxides" U.S. Department of Health Education and Welfare Public Health Service. (Bureau of Disease prevention and Environmental Control Nation Center for air pollution control Washington, D.C. March, 1967).

33. Schroeter, L.C. Sulfur Dioxide : Applications in Foods, Beverages and Pharmaceuticals pp. 179-180, The Upjohn Company Research Laboratories Kalamazoo, Michigan, Pergamon Press, 1966.

34. Beuerman, D.R. and Meloan, C.E. "Determination of Sulfur in Organic Compounds by Gas Chromatography" Anal. Chem. 34, (1962): 319.

35. Stephens, B.G. and Lindstrom, F. "Spectrophotometric Determination of Sulfur Dioxide Suitable for Atmospheric Analysis" Anal.Chem. 36(7), (1964) : 1308-1312.

36. Hicky, H.R. and Hendrickson, E.R. "A Design Basis for Lead Dioxide Cylinders" J.Air Poll. Control Associ. 15, (1965) : 409-414.

37. Huey, N.A. "The Lead Dioxide Estimation of Sulfur Dioxide Pollution" J. Air Poll. Control Assoc. 18, (1968) : 610-611.

38. Urone, P., Evans, J.B. and Noyes, C.M. "Tracer Techniques in Sulfur Dioxide Air Pollution Studies Apparatus and Studies of Sulfur Dioxide Colorimetric and Conductometric Methods" Anal. Chem. 37 (9), (1965) : 1105-1107.

39. Barendrecht, E. and Martens, W. "Completely Automatic, Coulometric Titration Apparatus for Process Use Determination of Sulfur Dioxide in Gases with Concentrations Ranging from 0.1 to 100 % by Volume" Anal. Chem. 34 (1), 1962 : 138-142.

40. Scaringelli, F.P., Saltzmann, B.E. and Frey, S.A. "Spectrophotometric Determination of Atmospheric Sulfur Dioxide" Anal. Chem. 39, (1967) : 1709-1719.

41. Syty, A. "Determination of Sulfur Dioxide by Ultraviolet Absorption Spectrometry" Anal. Chem. 45(9), (1973) : 1744-1747.

42. Axelrod, H.D., Bonelli, J.E. and Ladge, J.P., Jr. "Fluorimetric Determination of Sulfur Dioxide as Sulfite" Anal. Chem. 42(4), (1970) : 512-514.

43. Lambert J.L., Chylava, M.J., Paukstelies, J.V. and Liu, A.T., " 4 Nitro-1,2-Diaminobenzene as a new chromogen in the West-Gaeke Method for Sulfur Dioxide" Analytica. Chimica Acta. 99, (1978) : 379-382.

44. Fein, R.S. and Bailey, B.S. "Conductimeteric and Pararosaniline Method Sulfur Dioxide Monitoring Uncertainties nad Their Significance" Environ, Sci. & Tech. 12(4), (1978) : 463-465.

45. Fernández, T., Luis, A.G. and Montelongo, F.G. "Spectrophotometric Determination of Sulphate for Measuring Sulphur Dioxide in Air" Analyst. 105, (1980) : 317-327.

46. Dasgupta, P.K., De Cesare, K. and Ullrey, J.C., "Determination of Atmospheric Sulfur Dioxide without Tetrachloromercurate (II) and the Mechanism of the Schiff Reaction" Anal. Chem. 52(12), (1980) : 1912-1922.

47. Dasgupta, P.K. "Fluorometric Determination of Atmospheric Sulfur Dioxide without Tetrachloromercurate (II)" Anal. Chem. 53(13), (1981) : 2084-2087.

48. Vinjamoori, B.V. and Ling, C.S. "Personal Monitoring Method for Nitrogen Dioxide and Sulfur Dioxide with Solid Sorbent Sampling and Ion Chromatographic Determination" Anal.Chem. 53(11), (1981) : 1689-1691.

49. Suleiman, A.A.and Guilbault, G.G. "Mercury Displacement in the Determination of SO_2 with a Piezoelectric Crystal Detector" Anal. Chem. 56 (14), (1984) : 2964-2966.

50. Irgum, K. and Lindgren, M. "Solid Sorbent for Sampling of Sulfur Dioxide in Occupational Hygiene." Anal.Chem. 57 (7), (1985) : 1330-1335.

51. Margeson, J.H., Knoll, J.E., Midget, M.R., Oldaker III, G.B. and Reynolds, W.E., "Determination of Sulfur Dioxide, Nitrogen Oxides and Carbon Dioxide in Emissions from Electric Utility Plants by Alkaline Permanganate Sampling and Ion Chromatography" Anal. Chem. 57 (8), (1985) : 1586-1590.

52. Williamson, S.J. Fundamentals of Air Pollution. pp. 389-392, Addison-Wesley Publishing Company, 1973.

53. Office of the National Environment Board. "Environmental Quality Standard in Thailand" August, 1980.

54. World Health Organization. "Selected Methods of Measuring Air Pollutants" Publication No. 24, Geneva, Switzerland, 1976.

55. Thomas, L.C. and Chamberlin, G.J. Colorimetric Chemical Analytical Method, 8 th ed., pp. 354-355, The Tintometer Ltd, Salisbury England, 1974.

56. Scott, W.W., Standard Methods of Chemical Analysis, 5 th ed., pp. 928-929, D.Van Nostrand Company, Inc., 250 Fourth Avenue, 1946.

57. Nauman, R.V., West, P.W., Tron, F. and Gaeke, G.C., "A Spectrophotometric Study of the Schiff Reaction as Applied to the Quantitative Determination of Sulfur Dioxide" Anal. Chem. 32(10), (1960) : 1307-1311.

58. Silverstein, R.M., Bassler, C.G. and Morrill, T.C., Spectrometric Identification of Organic compounds, 3 rd ed., pp 231-238, John Wiley & Sons, Inc., 1974.

59. Cleary, G.J. and Thiele, B.R. "WHO/UNEP Global Air Quality Monitoring Project Combined WPRO/SEARO Workshop on Air Monitoring" Bangkok, 1977.

60. Willard, H.H., Merritt, L.L., Jr. and Dean, J.A., Instrumental Method of Analysis, 4 th ed., p 78, D.van Nostrand Company, Inc., 1965.

61. Research Appliance Company "3 Gas Sampler" RAC Bull. 2441, 1977.

62. Rossano, A.T., Jr. Air Pollution Control Guidebook for Management. p 64, Mc Grow-Hill Book Company, 1969.

63. Pate, J.B., Amons, B.E., Swanson, G.A., and Lodge, J.P.. Jr., "Nitrite Interference in Spectrophotometric Determination of Atmospheric Sulfur Dioxide" Anal.Chem. 37 (7), (1965): 942-945.

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