SULFUR DIOXIDE

Prepared at the 51st JECFA (1998), published in FNP 52 Add 6 (1998) superseding specifications prepared at the 49th JECFA (1997), published in FNP 52 Add 5 (1997). Group ADI 0-0.7 mg/kg bw as SO2 for sulfites, established at the 51st JECFA in 1998.

SYNONYMS

INS No. 220

DEFINITION

C.A.S. number: 7446-09-5

Chemical formula: SO_2

Formula weight: 64.07

Assay: Not less than 99.9 % SO_2 by weight

DESCRIPTION

Colourless, non-flammable gas, with strong, pungent, suffocating odour. Its vapour density is 2.26 times that of air at atmospheric pressure and 0^o. The specific gravity of the liquid is about 1.436 at $0^o/4^o$. At 20^o the solubility is about 10 g of SO_2 per 100 g of solution. It is normally supplied under pressure in containers in which it is present in both liquid and gaseous phases.

Caution: Sulfur dioxide gas is intensely irritating to the eyes, throat, and upper respiratory system. Liquid sulfur dioxide may cause skin burns, which result from the freezing effect of the liquid on tissue. Safety precautions to be observed in handling of the material are specified in technical brochures from liquid sulfur dioxide manufacturers, suppliers or organizations of gas manufacturers or suppliers (For example, "Pamphlet G-3" published by the Compressed Gas Association, Suite 1004, 1725 Jefferson Davis Highway, Arlington, VA 22202, USA).

FUNCTIONAL USES

Preservative, antibrowning agent, antioxidant,

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4): Soluble in water (36 v in 1 v) and ethanol (114 v in 1 v).

Test for sulfurous substances: The sample blackens filter paper moistened with mercurous nitrate TS.

Oxidizing activity: Expose a filter paper, treated with potassium iodate and starch TS, to the sample. A blue colour is developed that fades on continued exposure.

PURITY

Water (Vol. 4): Not more than 0.05%

Transfer about 50 ml of liquid sulfur dioxide into a Karl Fischer titration jar, determine the weight of the sample taken, and determine the water content by Karl Fischer Method

Non-volatile residue

Not more than 0.05%
Measure out 200 ml of sulfur dioxide (288 g) into a 250-ml Erlenmeyer flask, and determine the weight of sample taken by the loss in weight of the sample bomb. Evaporate to dryness on a steam bath, and displace the residual vapours with dry air. Wipe the flask dry, cool in a desiccator, and weigh.

Selenium (Vol. 4)

Not more than 20 mg/kg
A 2.0-ml portion of the Sample Solution meets the requirements of the Selenium Limit Test, Method II. For sampling and sample preparation, see TESTS

Lead (Vol. 4)

Not more than 5 mg/kg
Determine using an atomic absorption technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4, “Instrumental Methods.”

TESTS

Sampling:

Samples of sulfur dioxide may be safely withdrawn from a tank or transfer lines, either of which should be equipped with a 1-cm nozzle and valve. Samples should be taken in bombs constructed of 316 stainless steel, designed to withstand 7 MPa (1000 psig) and equipped with 316 stainless steel needle valves on both ends. To draw a sample, the bomb is first flushed with dry air to remove any sulfur dioxide, remaining from previous sample drawings, and then attached to the tank or transfer lines with a solid pipe connection. A hose is connected to the other end of the bomb and submerged in either a weak caustic solution or water. Any gas in the bomb is discharged into the caustic or water by first opening the valve at the pipe end, followed by slowly opening at the valve at the hose end. When all of the gas is dispelled and liquid sulfur dioxide begins to emerge into the solution, the valve at the hose end is blocked off. The other valves are then tightly closed, and the bomb is detached from the pipe connecting it to the tank or transfer line. Approximately 15% of the liquid sulfur dioxide in the bomb is then discharged into the water or caustic solution. The bomb is then capped at its end and transferred to the laboratory for analysis.

Caution: The bomb should never be stored with more than 85% of the total water capacity of the bomb.

Sample Solution for the Determination of Lead, and Selenium:
Measure out 100 ml of sulfur dioxide (144 g) into a 125-ml Erlenmeyer flask, and determine the weight of sample taken by the loss in weight of the sample bomb. Evaporate to dryness on a steam bath, add 3 ml of nitric acid and 10 ml of water to the dry flask, and warm gently on a hot plate for 15 min. Transfer the contents of the flask to a 100-ml volumetric flask, dilute to volume with water, and mix. Transfer a 10.0-ml aliquot into a second 100-ml volumetric flask, dilute to volume with water, and mix.

Note: The tests in which this solution is to be used will be accurate assuming a 144 g sample has been taken; if not, the weight of sample actually taken must be considered in the calculations.

METHOD OF ASSAY

Subtract from 100 the percentages of non-volatile residue and of water, as determined herein, to obtain the percentage of SO_2.