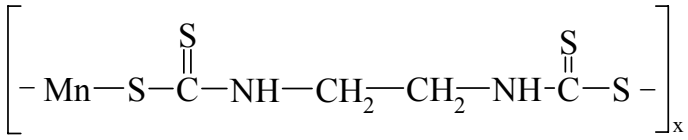
MANEB
61



ISO common name	Maneb
Chemical name	Manganese ethylenebis(dithiocarbamate) (IUPAC); [1,2-ethanediylbis(carbamodithioato)(2-)]manganese (CA; *12427-38-2*)
Empirical formula	$C_4H_6MnN_2S_4$
RMM	265.3
m.p.	Decomposes
v.p.	Less than 10^{-4} Pa
d	1.92
Solubility	Insoluble in water and most organic solvents
Description	Yellow polymorphic solid
Stability	Gradual decomposition, particularly in presence of moisture and oxygen or acids
Formulations	Wettable powders and granules, dustable powders and suspension concentrates

MANEB TECHNICAL
*61/TC/M/-

1 Sampling. Take at least 200 g. Completely fill the bottles and store them at 5 °C or below (not longer than 4 weeks).

2 Identity tests

2.1 CS_2 evolution MT 153, CIPAC F, *p 360*.

2.2 Spot test. MT 130, CIPAC F, *p 320*

2.3 UV absorption test. MT 165, CIPAC F, *p 411*.

2.4 Identification of amines MT 152, CIPAC F, *p 357*

* CIPAC method, 1965; revised 1967, 1968. Prepared by the Dithiocarbamates Subcommittee of PAC; Chairman, H Crossley (The Murphy Chemical Co. Ltd).

3 Maneb

OUTLINE OF METHOD Maneb, dissolved in tetrasodium EDTA solution, is decomposed by boiling sulphuric acid to ethylenediamine sulphate and carbon disulphide. The latter is passed through a cadmium sulphate scrubber to remove any hydrogen disulphide, and then into an absorption train containing methanolic potassium hydroxide to afford potassium methyl xanthate which, after neutralization with dilute acetic acid, is titrated with standard iodine.

REAGENTS

Sodium diethyldithiocarbamate trihydrate. Check the purity of sodium diethyldithiocarbamate as follows: Dissolve about 0.5 g of the material (*w* g) in water (100 ml) and titrate, directly, with aqueous iodine c(1/2 I2) = 0.1 mol/l, using starch as indicator (t ml). 1 ml iodine solution, c(1/2 I2) = 0.1 mol/l, ≡ 0.02253 g of sodium diethyldithiocarbamate trihydrate.

$$\text{Sodium diethyldithiocarbamate trihydrate} = \frac{225.3 \times t \times N}{w} \quad \text{g/kg}$$

where:

N = Normality of the iodine.

Sulphuric acid *c* (1/2 H_2SO_4) = approximately 4 mol/l.
Tetrasodium salt of ethylenediaminetetraacetic acid (tetrasodium EDTA), RE 37
Potassium hydroxide 2 mol/l methanolic solution, containing less than 1 mg/l of copper and iron, RE 21.5
Cadmium sulphate Dissolve cadmium sulphate (18.5 g) in distilled water (100 ml)
Acetic acid 10% w/v solution
Phenolphthalein indicator solution, RE 19.1
Starch indicator solution, RE 27.1
Iodine standard solution, *c* (1/2 I2) = 0.1 mol/l, RE 16.1

APPARATUS

Weighing funnel consisting of a boat shaped scoop with a hollow handle at one end through which the sample is poured into the flask.
Apparatus as shown in Fig. 1. All joints must be absolutely gas tight. Phosphoric acid may be used for this purpose, but petroleum jelly or silicone grease is just as effective, if used in small quantities. The air bleed should reach as near the bottom of the flask as is practicable. Any efficient absorption train can be used. The methanolic potassium hydroxide absorbers and bubblers should be dry, or should be rinsed out with methanol before use.
Beaker 600 ml
Burettes 50 ml

PROCEDURE

(a) Testing of the apparatus. Carry out the whole procedure using the sodium diethyldithiocarbamate; if correctly carried out recoveries of between 99 and 101% will be obtained.

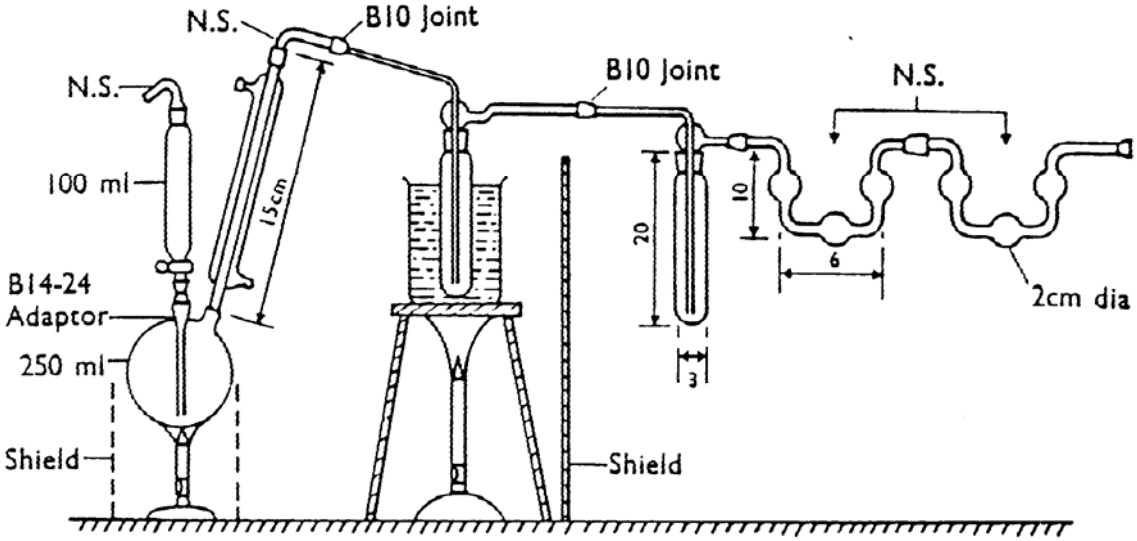


Fig. 1 Apparatus for the determination of maneb. All parts, unless otherwise stated, are standard ground fittings. N.S. = non-standard. Dimensions in cm.

(b) Determination. Assemble the apparatus, as shown in Fig. 1, with cadmium sulphate (30 ml) in the first absorber, and methanolic potassium hydroxide in the second (25 ml) and in each of the bubblers (5 ml in each). The main methanolic absorber should be kept cold by immersing it in a beaker of melting ice. Turn on the condenser water, and heat the water bath surrounding the first absorber to, and maintain at, 70 to 80 °C throughout the determination. Weigh (to the nearest 0.1 mg), from the weighing funnel, about 0.4 g of the sample (w g) and transfer to the digestion flask. Assemble the dropping funnel and air bleed and add the tetrasodium EDTA (20 ml) through the funnel. Allow 1 min for the dispersion of the sample, swirling the digestion flask a few times to ensure complete dispersion in the EDTA, then add, through the dropping funnel, boiling sulphuric acid solution (50 ml), and heat the flask immediately. Connect the tube at the end of the absorption train to a controlled vacuum supply, so that approximately three bubbles of air per second pass through the absorbers.
Maintain a brisk rate of reflux until the sample is fully decomposed; about 30 min is needed. Then turn off the condenser cooling water for about 2 to 3 min, thus

flushing the condenser and cadmium sulphate absorber with steam to ensure complete removal of carbon disulphide.
Remove the burner, disconnect the absorption train and, without delay, carry out the determination of the carbon disulphide as follows:
Carefully wash the contents of the methanolic potassium hydroxide absorber and bubblers into the 600 ml beaker using distilled water (300 to 400 ml); add one or two drops of phenolphtalein, neutralize with acetic acid from a burette, and add three drops in excess. Then, with continuous stirring, titrate the solution immediately, i.e., within 2 min, with the iodine solution to near the end point, add starch indicator solution, and complete the titration (*t* ml). If the titration is not completed within about 2 min after the addition of the acetic acid, the solution should be discarded and the analysis repeated. Carry out a blank determination omitting the sample (*b* ml). 1 ml iodine, c (1/2 I_2) = 0.1 mol/l = 0.01327 g of maneb.

(c) Calculation

$$\text{Maneb content} = \frac{132.7 \times N \times (t - b)}{w} \text{ g/kg}$$

where:
- N = normality of the standard iodine solution
- t = volume of standard iodine solution (ml)
- b = volume of standard iodine solution used for the blank determination (ml)
- w = mass of sample taken (g)

4 Manganese. As for mancozeb technical **34**/TC/M/4, CIPAC H, *p 195*.

MANEB WETTABLE POWDERS
61/WP/M/-

1 Sampling. Take at least 500 g. Completely fill the bottles and store them at 5 °C or below (not longer than 4 weeks).

2 Identity tests. As for maneb technical **61**/TC/M/2.

3 Maneb. As for maneb technical **61**/TC/M/3.

4 Manganese. As for mancozeb technical **34**/TC/M/4, CIPAC H, *p 195*.

5 Suspensibility

APPARATUS AND REAGENTS As for MT 15, and **61**/TC/M/3 except: that, if the presumed maneb is below 0.15 g, then use standard iodine solution c (1/2 I_2) = 0.05 mol/l.

PROCEDURE

(a) Preparation of the suspension MT 15.1 (*i*)
(b) Determination of sedimentation MT 15.1 (*ii*)
(c) Determination of maneb in the bottom 25 ml of suspension Transfer, quantitatively, the 25 ml of suspension remaining in the cylinder to the 250 ml reaction flask, using the minimum quantity of water, and in no case exceeding 10 ml. Continue as under 61/TC/M/3, "Assemble the dropping funnel"..... Mass of maneb in the 25 ml of suspension = 0.1327 N (*t* - *b*) = Q g.

(d) Calculation

$$\text{Suspensibility} = \frac{111(c - Q)}{c} \%$$

where:

- c = mass of maneb in the sample taken for the preparation of the suspension (g)
- Q = mass of maneb in bottom 25 ml of suspension (g)

MANEB WATER DISPERSIBLE GRANULES
61/WG/M/-

1 Sampling. Take at least 500 g. Completely fill the bottles and store them at 5 °C or below (not longer than 4 weeks).

2 Identity tests. As for maneb technical 61/TC/M/2.

3 Maneb. As for maneb technical 61/TC/M/3.

4 Manganese. As for mancozeb technical **34**/TC/M/4, CIPAC H, *p 195*.

5 Suspensibility. As for MT 168 and maneb wettable powders **61**/WP/M/5.

MANEB DUSTABLE POWDERS
*61/DP/M/-

1 Sampling. Take at least 1 kg. Completely fill the bottles and store them at 5 °C or below (not longer than 4 weeks).

2 Identity tests. As for maneb technical 61/TC/M/2.

3 Maneb. As for maneb technical 61/TC/M/3.

4 Manganese. As for mancozeb technical **34**/TC/M/4, CIPAC H, *p 195*.

5 Dry sieve test

APPARATUS and REAGENTS As for MT 59.1, and **61**/TC/M/3 except:
Iodine standard solution c (1/2 I_2) = 0.05 mol/l.

PROCEDURE
(a) Sieve test MT 59.1
(b) Determination of maneb in the residue on the test sieve. Carefully invert the test sieve over a piece of tared glazed black paper, brush the residue onto the paper, and determine the mass of the residue. Use all the material left on the test sieve.
(c) Calculation

Mass of maneb in the residue = 0.1327 × N × (t - b) g

Maneb in the residue expressed as percentage of the original sample taken for the sieve test $= = \frac{13.27 \times N \times (t - b)}{w}$

where:

N = normality of the iodine standard solution
w = mass of sample taken (g)

* CIPAC method 1965; revised 1967, 1968.

MANEB SUSPENSION CONCENTRATES
61/SC/M/-

1 Sampling. Take at least 1 l. Completely fill the bottles and store them at 5 °C or below (not longer than 4 weeks). Homogenize before use.

2 Identity tests. As for maneb **61**/TC/M/2.

3 Maneb. As for maneb **61**/TC/M/3.

4 Manganese. As for mancozeb technical **34**/TC/M/4, CIPAC H, *p 195*.

5 Suspensibility.
APPARATUS and REAGENTS As for MT 161, CIPAC F, *p 394*, and **61**/TC/M/3 except that, if the presumed maneb is below 0.15 g then use standard iodine solution c (1/2 I_2) = 0.05 mol/l.

PROCEDURE
(a) Preparation of suspension and determination of sedimentation. MT 161, CIPAC F, *p 394*.
(b) Determination of maneb in the bottom 25 ml of suspension. As for maneb wettable powders *61*/WP/M/5 (*c*).
(c) Calculation. As for wettable powders **61**/WP/M/5 (*d*).