

Wavelength: 357.9 nm.

Atomisation device: air-acetylene flame.

Copper: maximum 50.0 ppm.

Atomic absorption spectrometry (2.2.23, *Method II*).

Test solution. Solution S.

Reference solutions. Prepare the reference solutions using *copper standard solution (0.1 per cent Cu) R*, diluted as necessary with a 5 per cent V/V solution of *lead-free nitric acid R*.

Source: copper hollow-cathode lamp using a transmission band preferably of 1 nm.

Wavelength: 324.7 nm.

Atomisation device: air-acetylene flame.

Ferric ions: maximum 0.50 per cent.

In a ground-glass-stoppered flask, dissolve 5.00 g in a mixture of 10 ml of *hydrochloric acid R* and 100 ml of *carbon dioxide-free water R*. Add 3 g of *potassium iodide R*, close the flask and allow to stand in the dark for 5 min. Titrate the liberated iodine with *0.1 M sodium thiosulphate*, using 0.5 ml of *starch solution R*, added towards the end of titration, as indicator. Carry out a blank test in the same conditions. Not more than 4.5 ml of *0.1 M sodium thiosulphate* is used.

Manganese: maximum 0.10 per cent.

Atomic absorption spectrometry (2.2.23, *Method II*).

Test solution. Dilute 1.0 ml of solution S to 20.0 ml with a 5 per cent V/V solution of *lead-free nitric acid R*.

Reference solutions. Prepare the reference solutions using *manganese standard solution (1000 ppm Mn) R*, diluted as necessary with a 5 per cent V/V solution of *lead-free nitric acid R*.

Source: manganese hollow-cathode lamp using a transmission band preferably of 1 nm.

Wavelength: 279.5 nm.

Atomisation device: air-acetylene flame.

Nickel: maximum 1.00×10^2 ppm.

Atomic absorption spectrometry (2.2.23, *Method I*).

Test solution. Solution S.

Reference solutions. Prepare the reference solutions using *nickel standard solution (10 ppm Ni) R*, diluted as necessary with a 5 per cent V/V solution of *lead-free nitric acid R*.

Source: nickel hollow-cathode lamp using a transmission band preferably of 1 nm.

Wavelength: 232.0 nm.

Atomisation device: air-acetylene flame.

Zinc: maximum 1.00×10^2 ppm.

Atomic absorption spectrometry (2.2.23, *Method II*).

Test solution. Solution S.

Reference solutions. Prepare the reference solutions using *zinc standard solution (100 ppm Zn) R*, diluted as necessary with a 5 per cent V/V solution of *lead-free nitric acid R*.

Source: zinc hollow-cathode lamp using a transmission band preferably of 1 nm.

Wavelength: 213.9 nm.

Atomisation device: air-acetylene flame.

ASSAY

Dissolve 2.5 g of *sodium hydrogen carbonate R* in a mixture of 150 ml of *water R* and 10 ml of *sulphuric acid R*. When the effervescence ceases, add to the solution 0.140 g of the

substance to be examined and dissolve with gentle shaking. Add 0.1 ml of *ferroin R* and titrate with *0.1 M ammonium and cerium nitrate* until the red colour disappears.

1 ml of *0.1 M ammonium and cerium nitrate* is equivalent to 15.19 mg of FeSO_4 .

STORAGE

In an airtight container.

01/2008:0083

FERROUS SULPHATE HEPTAHYDRATE

Ferrosi sulfas heptahydricus

$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
[7720-78-7]

M_r 278.0

DEFINITION

Content: 98.0 per cent to 105.0 per cent.

CHARACTERS

Appearance: light green, crystalline powder or bluish-green crystals, efflorescent in air.

Solubility: freely soluble in water, very soluble in boiling water, practically insoluble in alcohol.

Ferrous sulphate is oxidised in moist air, becoming brown.

IDENTIFICATION

A. It gives the reaction of sulphates (2.3.1).

B. It gives reaction (a) of iron (2.3.1).

C. It complies with the limits of the assay.

TESTS

Solution S. Dissolve 2.5 g in *carbon dioxide-free water R*, add 0.5 ml of *dilute sulphuric acid R* and dilute to 50 ml with *water R*.

Appearance of solution. Solution S is not more opalescent than reference suspension II (2.2.1).

pH (2.2.3): 3.0 to 4.0.

Dissolve 0.5 g in *carbon dioxide-free water R* and dilute to 10 ml with the same solvent.

Chlorides (2.4.4): maximum 300 ppm.

Dilute 3.3 ml of solution S to 10 ml with *water R* and add 5 ml of *dilute nitric acid R*. The solution complies with the limit test for chlorides. Prepare the standard using a mixture of 10 ml of *chloride standard solution (5 ppm Cl) R* and 5 ml of *dilute nitric acid R*. Use 0.15 ml of *silver nitrate solution R2* in this test.

Ferric ions: maximum 0.5 per cent.

In a ground-glass-stoppered flask, dissolve 5.00 g in a mixture of 10 ml of *hydrochloric acid R* and 100 ml of *carbon dioxide-free water R*. Add 3 g of *potassium iodide R*, close the flask and allow to stand in the dark for 5 min. Titrate the liberated iodine with *0.1 M sodium thiosulphate*, using 0.5 ml of *starch solution R*, added towards the end of the titration, as indicator. Carry out a blank test in the same conditions. Not more than 4.5 ml of *0.1 M sodium thiosulphate* is used, taking into account the blank titration.

Manganese: maximum 0.1 per cent.

Dissolve 1.0 g in 40 ml of *water R*, add 10 ml of *nitric acid R* and boil until red fumes are evolved. Add 0.5 g of *ammonium persulphate R* and boil for 10 min. Discharge any pink colour by adding dropwise a 50 g/l solution of *sodium*

sulphite R and boil until any odour of sulphur dioxide is eliminated. Add 10 ml of *water R*, 5 ml of *phosphoric acid R* and 0.5 g of *sodium periodate R*, boil for 1 min and allow to cool. The solution is not more intensely coloured than a standard prepared at the same time in the same manner using 1.0 ml of *0.02 M potassium permanganate* and adding the same volumes of the same reagents.

Zinc: maximum 500 ppm.

To 5 ml of solution A obtained in the test for heavy metals add 1 ml of *potassium ferrocyanide solution R* and dilute to 13 ml with *water R*. After 5 min, any turbidity produced is not more intense than that of a standard prepared at the same time by mixing 10 ml of *zinc standard solution (10 ppm Zn) R*, 2 ml of *hydrochloric acid R1* and 1 ml of *potassium ferrocyanide solution R*.

Heavy metals (2.4.8): maximum 50 ppm.

Dissolve 1.0 g in 10 ml of *hydrochloric acid R1*, add 2 ml of *strong hydrogen peroxide solution R* and boil until the volume is reduced to 5 ml. Allow to cool, dilute to 20 ml with *hydrochloric acid R1*, transfer the solution to a separating funnel and shake for 3 min with 3 quantities, each of 20 ml, of methyl isobutyl ketone saturated with hydrochloric acid (prepared by shaking 100 ml of freshly distilled *methyl isobutyl ketone R* with 1 ml of *hydrochloric acid R1*). Allow to stand, separate the aqueous layer and reduce to half its volume by boiling, allow to cool and dilute to 25 ml with *water R* (solution A). Neutralise 10 ml of solution A to *litmus paper R* using *dilute ammonia R1* and dilute to 20 ml with *water R*. 12 ml of the solution complies with limit test A. Prepare the standard using *lead standard solution (1 ppm Pb) R*.

ASSAY

Dissolve 2.5 g of *sodium hydrogen carbonate R* in a mixture of 150 ml of *water R* and 10 ml of *sulphuric acid R*. When the effervescence ceases add to the solution 0.500 g of the substance to be examined and dissolve with gentle shaking. Add 0.1 ml of *ferroin R* and titrate with *0.1 M ammonium and cerium nitrate* until the red colour disappears.

1 ml of *0.1 M ammonium and cerium nitrate* is equivalent to 27.80 mg of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.

STORAGE

In an airtight container.

01/2008:1516
corrected 6.0

FEVERFEW

Tanacetii parthenii herba

DEFINITION

Dried, whole or fragmented aerial parts of *Tanacetum parthenium* (L.) Schultz Bip.

Content: minimum 0.20 per cent of parthenolide ($\text{C}_{15}\text{H}_{20}\text{O}_3$; M_r 248.3) (dried drug).

CHARACTERS

Camphoraceous odour.

IDENTIFICATION

A. The leafy, more or less branched stem has a diameter of up to 5 mm; it is almost quadrangular, channelled longitudinally and slightly pubescent. The leaves

are ovate, 2-5 cm long, sometimes up to 10 cm, yellowish-green, petiolate and alternate. They are pinnate or bipinnate, deeply divided into 5-9 segments, each with a coarsely crenate margin and an obtuse apex. Both surfaces are somewhat pubescent and the midrib is prominent on the lower surface. When present, the flowering heads are 12-22 mm in diameter with long pedicels; they are clustered into broad corymbs consisting of 5-30 flower-heads. The hemispherical involucre is 6-8 mm wide and consists of many overlapping bracts, which are rather narrow, obtuse and scarious and have membranous margins. The central flowers are yellow, hermaphrodite, tube-shaped with 5 teeth and have 5 stamens inserted in the corolla; the filaments of the stamens are separate from each other but the anthers are fused into a tube through which passes the style, bearing 2 stigmatic branches. The peripheral flowers are female and have a white, three-toothed ligule, 2-7 mm long. The fruit is an achene, 1.2-1.5 mm long, brown when ripe, with 5-10 white longitudinal ribs. It is glandular and bears a short, crenate, membranous crown.

B. Reduce to a powder (355) (2.9.12). The powder is yellowish-green. Examine under a microscope using *chloral hydrate solution R*. The powder shows the following diagnostic characters: numerous large, multicellular, uniseriate covering trichomes consisting of a rhomboidal basal cell, 3-5 smaller, thick-walled rectangular cells and a very long, flat, slender terminal cell, often curved at a right angle to the axis of the basal cell; glandular trichomes with a short, biseriate, 2-4 celled stalk and a biseriate head of 4 cells around which the cuticle forms a bladder-like covering; epidermal cells with very sinuous, anticlinal walls, a striated cuticle and anomocytic stomata (2.8.3); numerous spirally and annularly thickened vessels; stratified parenchyma and collenchyma. Fragments of disc florets containing pale yellow amorphous masses and small rosette crystals of calcium oxalate may be present; spherical pollen grains about 25 µm in diameter, with 3 pores and a spiny exine may be present.

C. Thin-layer chromatography (2.2.27).

Test solution. To 1 g of the powdered drug (355) (2.9.12) add 20 ml of *methanol R*. Heat in a water-bath at 60 °C for 15 min. Allow to cool and filter. Evaporate to dryness under reduced pressure and dissolve the residue in 2 ml of *methanol R*.

Reference solution. Dissolve 5 mg of *parthenolide R* in *methanol R* and dilute to 5 ml with the same solvent.

Plate: TLC silica gel plate R.

Mobile phase: *acetone R*, *toluene R* (15:85 V/V).

Application: 20 µl, as bands.

Development: over a path of 10 cm.

Drying: in air.

Detection: spray with a 5 g/l solution of *vanillin R* in a mixture of 20 volumes of *anhydrous ethanol R* and 80 volumes of *sulphuric acid R*. Examine in daylight after 5 min.

Results: the chromatogram obtained with the test solution shows in its central part a blue principal zone that is similar in position, colour and size to the principal zone in the chromatogram obtained with the reference solution, and somewhat below the principal zone a 2nd blue zone may be present; 1 or 2 blue zones are also present in its lower third; other violet zones may be present.