Quantitation of manganese as permanganate

Chemicals

- Manganese (II)-sulfate-monohydrate
- Sulfuric acid conc.
- Sulfuric acid c=1 mol/L
- Phosphoric acid conc.
- Potassium periodate

Material

- Volumetric flask
- Volumetric pipette
- Graduated pipette
  Burettes
- Beaker glasses
- Heating device
- Thermometer
- UV/VIS-photometer
- Quartz cuvette
- Pipete aidr
- Squeeze bottle
- Plotting paper or personal computer for evaluation
- Precision balance

Safety tips

- Wear safety goggles

- Wear suitable safety gloves

Manganese(II)-sulfate-monohydrate • H373 H411 • P260 P273 P314 • CAUTION! 	Phosphoric acid conz. • H314 • P280 P301+P330+P331 P305+P351+P338 P309+P310 • HAZARD! 
Sulfuric acid, conz. • H314, H290 • P280, P301+P330+P331, P305+P351+P338, P309+P310 • HAZARD! 	Potassium periodate: • H272 H319 H335 H315 • P210 P280 P302+P352 P304+P340 P305+P351+P338 P309+P311 • HAZARD! 

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Experimental procedure

- Measuring wavelength 525 nm
- Molar extinction coefficient ε=1800 L/(mol·cm)
- Linearity of method E=0.20 bis 0.90
- Cuvette 1cm
- Blank solution de-ionised water
- Molar masses M($MnSO_4 \cdot H_2O$)=169.02 g/mol, M(Mn)=54.94 g/mol
- Stock solution ß(Mn^{2+})=10.00 mg/ml

- Planning of a dilution strategy
- Preparation of calibrating solutions as well as measuring them photometrically
- Preparation of a calibration curve and determination of the concentration of the samples

Processing of the samples:

- Sample with contaminated manganese sulfate w≈90% → determination of the total mass
- Dissolve the sample in 100 mL water and approx. 20 mL sulfuric acid 1 mol/L
- Oxidation

Operation instruction for the oxidation of Mn(II)-ions to Mn(VII)-ions:

- Dilute Mn(II)-containing solutions in 100 mL-beaker glasses with 10 mL water each
- Then add 10 mL conc. sulfuric acid, 5 mL conc. phosphoric acid and 0,4 g potassium periodate
- After adding potassium periodate heat the beaker glasses to 80°C and hold for 30 min
- Cool the solutions and fill them in 100 mL-volumetric flasks

Waste disposal:

- Please dispose of all wastes in the containers for halogen containing solutions

Analysis:

- Calculate the mass of manganese in mg of the obtained sample

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Preparation list

Chemicals:

- Sulfuric acid, conc. 120 mL
- Sulfuric acid c= 1mol/l 40 mL
- Phosphoric acid conc. 60 mL
- Potassium periodate 10 g
- Manganese sulfate-monohydrate
- Soduim chloride

Material:

- Volumetric flask
- Balance dish
- UV/VIS-photometer
- Quartz cuvettes
- Volumetric pipette
- Beaker glasses
- Measuring pipette
- Spatula
- Measuring cylinder
- Burette
- Pipette aid
- Squeeze bottle
- Drying oven
- Precision balance
- Plotting paper or personal computer with analysis software

Preparation of the sample:

- Weigh out 2.900g-3.200g manganese sulfate-monohydrate in a weighing glass and impurify it with approx. 300mg NaCl

Preparation of the Mn(II)-Ions containing stock solution

- Solve 15.3828 g manganese sulfate-monohydrate with water and 100 mL Sulfuric acid c= 1mol/L, fill it in a 500 mL volumetric flask und fill up with water
- 1 mL= 10.00 mg Mn

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