The redox reactions of sulfur dioxide

Apparatus and Chemicals

Each student will require the following:-

Apparatus

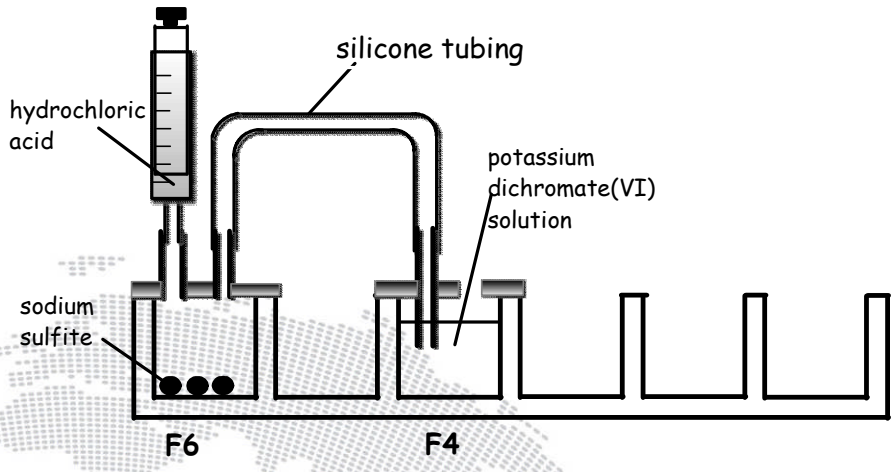
Comboplate®
Lid 1 and Lid 2
Silicone tubing
Syringe
Microspatula®
Wear eye protection

Chemicals

Sodium sulfite solid
Hydrochloric acid (2 moldm^{-3})
Sulfuric acid (1 moldm^{-3})
Potassium dichromate(VI) solid
Potassium manganate(VII)

Method

1. Using the scoop end of the microspatula the place 5 scoops of sodium sulfite into well F6.
2. Place lid 1 into the neck of the well.
3. Draw 2 cm^3 of the dilute hydrochloric acid into the syringe and place in the wider of the two chimneys of the lid.
4. Using the thin end of the microspatula place some potassium dichromate(VI) solid into well F4. Add sulfuric acid to the solid and stir until it is dissolved. Make sure the end of the long chimney is below the surface of the acid.
5. Place lid 2 into the neck of the well and connect the two lids using the silicone tubing.
6. The apparatus should now look like the apparatus in the diagram opposite.
7. Slowly add the hydrochloric acid to the sodium sulfite.
8. Make your observations.
9. Repeat the experiment but use acidified potassium manganate(VII) instead of the potassium dichromate(VI).



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10. ⚠ At the end of the experiment dispose of the residues in the fume-cupboard sink.

RESULTS

Write down your observations

Reactant	Observations
Potassium dichromate(VI) solution	
Potassium manganate(VII) solution	

CONCLUSIONS

The symbol equation for the preparation of the sulfur dioxide is given below:

$Na_2SO_3(s) + 2HCl(sq) \longrightarrow H_2O(l) + SO_2(g) + 2NaCl(aq)$

Write the ionic equation for the reaction

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The half-cell equations and their standard electrode potentials are given below.
Use them to write the complete equations for both reactions.

$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6e^- \longrightarrow 2Cr^{3+}(aq) + \_\_\_\_\_$ $E^\Theta = +1.33V$

$MnO_4^-(aq) + 8H^+(aq) + 5e^- \longrightarrow Mn^{2+}(aq) + 4H_2O(l)$ $E^\Theta = +1.51V$

$SO_2(g) + \_\_\_ \longrightarrow SO_4^{2-}(aq) + \_\_H^+(aq) + \_\_\_$ $E^\Theta = +0.17V$

Sulfur dioxide and dichromate(VI)

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Sulfur dioxide and manganate(VII)

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Using the values for the standard electrode potentials explain why the reactions take place.

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