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CERIMETRY

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• **Oxidations with cerium sulphate solution is called cerimetry.**

- **Cerium(IV) sulphate is a powerful oxidising agent; its reduction potential in 0.5-4.0M sulphuric acid at 25°C is 1.43 ± 0.05 volts.**
- **It can be used only in acid solution, best in 0.5M or higher concentrations: as the solution is neutralised, cerium(IV) hydroxide [or basic salts precipitate.**
- **The solution has an intense yellow colour, and in hot solutions which are not too dilute the end point may be detected without an indicator.**



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The advantages of cerium(IV) sulphate as a standard oxidising agent are:

- 1. Cerium(IV) sulphate solutions are remarkably stable over prolonged periods. They need not be protected from light, and may even be boiled for a short time without appreciable change in concentration.**
- 2. Cerium(IV) sulphate may be employed in the determination of reducing agents in the presence of a high concentration of hydrochloric acid .**
- 3. Cerium(IV)solutions in 0.1M solution are not too highly coloured to obstruct vision when reading the meniscus in burettes and other titrimetric apparatus.**



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Step by Step

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PREPARATION OF 0.1 M CERIUM SULPHATE

- Evaporate 55.0g of ammonium cerium nitrate almost to dryness with excess (48 mL) of concentrated sulphuric acid in a Pyrex evaporating dish.
- Method 1- Dissolve the resulting cerium (IV) sulphate in 1M sulphuric acid (28 mL concentrated sulphuric acid to 500mL water), transfer to a 1L graduated flask, add 1M sulphuric acid until near the graduation mark, and make up to the mark with distilled water. Shake well.



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METHOD 2.

- Weigh out 35-36g of pure cerium(IV) sulphate into a 500 mL beaker, add 56 mL of 1:1-sulphuric acid/water and stir, with frequent additions of water and gentle warming, until the salt is dissolved. Transfer to all glass-stoppered graduated flask, and when cold, dilute to the mark with distilled water. Shake well.
- Alternatively, weigh out 64-66g of ammonium cerium(IV) sulphate into a solution prepared by adding 28 mL of concentrated sulphuric acid to 500mL of water: stir the mixture until the solid has dissolved. Transfer to all graduated flask, and make up to the mark with distilled water



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STANDARDISATION OF CERIUM(IV) SULPHATE SOLUTIONS

- **Weigh out accurately about 0.2g of arsenic(III) oxide, previously dried at 105-110°C for 1-2 hours, and transfer to a 500 mL beaker or to a 500mL conical flask.**
- **Add 20 mL of approx. 2M sodium hydroxide solution, and warm the mixture gently until the arsenic(III) oxide has completely dissolved. Cool to room temperature, and add 100mL water, followed by 25 mL 2.5M sulphuric acid.**



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- **Then add 3 drops 0.01M osmium tetroxide solution (0.25 g osmium tetroxide dissolved in 100mL 0.05M sulphuric acid) and 0.5 mL N-phenylanthranilic acid indicator (or 1-2 drops of ferroin).**
- **Titrate with the 0.1M cerium(IV) sulphate solution until the first sharp colour change occurs.**
- **Repeat with two other samples of approximately equal weight of arsenic(III) oxide.**



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THANK YOU