

Tollens test

The Tollens test , or Tollens test, is used to demonstrate the presence of reducing substances in a sample. The test is based on the reduction of complex bound silver ions to metallic silver.

Preparation of Tollens reagent

Tollens' reagent, chemically **diamine silver nitrate** – $[\text{Ag}(\text{NH}_3)_2]\text{NO}_3$, is prepared in two steps.

1. Mixing sodium hydroxide (NaOH) with silver nitrate (AgNO_3) produces a brown-gray precipitate of silver oxide (Ag_2O).
2. By slowly adding ammonium hydroxide (NH_4OH), the precipitate gradually disappears, forming a complex $[\text{Ag}(\text{NH}_3)_2]^+$. When the solution becomes completely transparent, the Tollens reagent is ready.



Tollens' reagent is always prepared fresh. It is not advisable to store it for a long time, as explosive silver nitride forms in the solution over time.

Proof of reducing substances

If the reducing agent meets diamine silver nitrate, it will reduce the silver from the diamine complex. Evidence of the reaction is the formation of silver (Ag^0), which can be observed either as a mirror deposited on the walls of the test tube, or as mushroom silver (a macroscopic cluster of molecules floating in a solution resembling a sea sponge, which gradually settles at the bottom of the test tube).

An example can be the detection of an aldehyde group in reducing carbohydrates:



Practical use

The Tollens test is used not only in the detection of reducing compounds, but also in the production of thermoses - a glass container is coated with a continuous layer of silver using a large amount of Tollens reagent and, for example, glucose.

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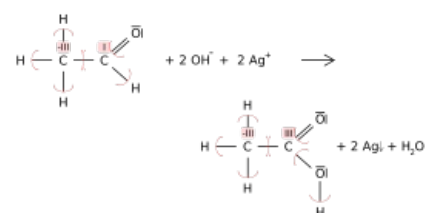
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References

- Tollens reagent Wikipedia article (https://en.wikipedia.org/wiki/Tollens%27_reagent) (cited 2014-10-25)

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Reaction



Mirror