

# 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 ( $\text{AgNO}_3$ ) produces a brown-gray precipitate of silver oxide ( $\text{Ag}_2\text{O}$ ).
2. By slowly adding ammonium hydroxide ( $\text{NH}_4\text{OH}$ ), the precipitate gradually disappears, forming a complex  $[\text{Ag}(\text{NH}_3)_2]^+$ . When the solution becomes completely transparent, the Tollens reagent is ready.

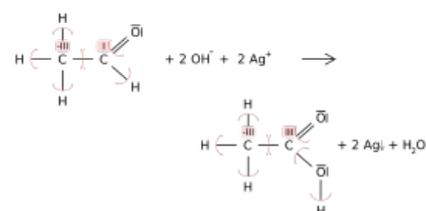
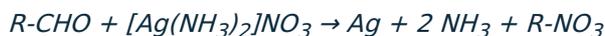


Tollens' reagent is always prepared fresh. It is not advisable to store it for a long time, as explosive silver nitride forms in the solution over time.

## 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 ( $\text{Ag}^0$ ), 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.

## Links

### Related articles

- Carbohydrates
- Glucose
- Glucose in the urine

### References

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

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