

POLISHING SILVERWARE

the scientific explanation

When exposed to air, silverware darkens because of a chemical reaction between the silver atoms and sulfur-containing compounds present in the air as gases, forming silver sulfide – the black coating.

How can tarnished silverware be cleaned?

Silverware will not tarnish if we prevent its exposure to air. Once tarnished, silverware can be cleaned by scrubbing it with toothpaste and a toothbrush, or by immersing it in an aluminum-lined bowl with hot water, in which we dissolved baking soda.

What is actually happening here?

If we polish silverware with some toothpaste, we are physically stripping away the thin coating of silver (sulfide) atoms from the surface.

In the second method, of dipping silverware in a bowl with aluminum foil and baking soda solution, we are actually creating the conditions for the reversal of the chemical reaction that caused the silver to tarnish in the first place. When exposed to air, silver atoms combine with sulfur atoms to form silver sulfide; inside the bowl, aluminum, which is more chemically reactive than silver, reacts with the tarnish in a process called “reduction,” and converts the silver sulfide back into silver atoms and sulfide compounds (you may smell them).

How do the baking soda and aluminum polish the silverware?

We have actually created an electrochemical cell, in which the aluminum donates electrons to the silver and sulfur compounds as it becomes oxidized. In order for the electrons to move from the aluminum to the silver, an electrical circuit must be closed within the solution; that is, both substances must be inside an electricity-conducting solution. That's exactly why we added salt and baking soda to the water: So that the solution better conducts electricity. Baking soda has an additional role – it reacts with the sulfur compounds formed during the reaction, helping to speed up the process