

Insights into the History and Properties of Silver (Ag): a Distinctive Female Chemical Element

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Topic: The Periodic Table and chemical education, past, present and future

Abstract:

This account presents an update review on the history, properties and uses of silver. We have selected this metal since in Spain silver is a very particular chemical element. This exceptionality is due to the fact that in Spanish it is the only element of the feminine gender in the entire periodic table.

Silver has been considered a multifaceted asset throughout history¹. It is one of the seven metals known since antiquity, being even mentioned in the book of Genesis. The heaps of slag found in Asia Minor and Aegean islands would indicate that the metal began to separate from lead at least four millennia before our era.

Silver stands out for its polish-susceptible white metallic shine. It remains in water and air, although its surface is fogged in the presence of ozone, hydrogen sulfide or air with sulfur. Chemically, silver is an inactive metal, extensively used throughout recorded history for a variety of medical purposes². Silver along with aluminum and gold are the most reflective metals, and it has the highest electrical and thermal conductivity.

Silver is the most versatile metal in the world, with thousands of uses. It is antibacterial, durable, reflective and malleable. Because of its multitude of uses, more than half of silver demand is from industrial processes. Unique properties make silver indispensable to industry, and there are more patents issued every year relating to silver than every other metal.

The coverage focuses essentially on the health uses, monetary uses and industrial uses of silver, stressing the great relevance of this element at present.



Table 1. Characteristics of the Silver element

Symbol	Ag
Atomic Number	47
Electron Configuration	[Kr]4d ¹⁰ 5s ¹
Atomic Mass	107.8682 amu
Isotopes	¹⁰⁷ Ag; ¹⁰⁹ Ag
Density (293 K)	10.5 g/cm ³
Melting point	1235.1 K
Boiling Point	2428.0 K
Heat of Atomization	284.09 kJ/mol
Heat of Fusion	11.30 kJ/mol
Heat of vaporization	250.58 kJ/mol
Crystal structure	Cubic (face-centered)
Hardness	3.25 mohs
Electronegativity	1.93 (Pauling)
Atomic radius	144 pm
Covalent radius	145±5 pm
Ionisation energies	1st: 731 kJ/mol 2nd: 2070 kJ/mol 3rd: 3361 kJ/mol

References

1. W.R. Hill, D.M. Pillsbury. *Argyria—The Pharmacology of Silver*, 1939, Williams & Wilkins, Baltimore.



2. J.W. Alexander. *SurgicalInfections*, **2009**, 10, 289-292.