

Bromine & the Reduction of Mercury Emissions

Bromine's symbol is Br

It is part of the halogen group of the periodic table.

Bromine is a reddish brown liquid. It is never naturally found in its elemental form but in inorganic compounds, known also as bromides, and in natural bromo-organic compounds¹. These are found in

soils, salts, air and sea water.

"Without bromine, there are no animals"

Billy Hudson

Ph.D - Vanderbilt University

A 2014 study² showed that bromine is part of the 28 elements that are essential to human life. It enables tissue development in all animals and humans.



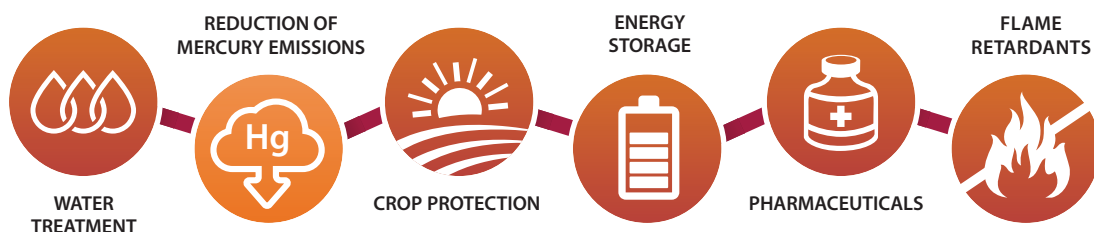
Bromine was discovered by the French scientist

Antoine Balard in 1826

while he was studying salt marsh flora from Mediterranean waters in France. He crystallized the salts and saturated the remaining liquid with chlorine. What was left behind after distillation was a dark red liquid: bromine.

APPLICATIONS

Since bromine was discovered, various bromine compounds have been used in important fields such as



Focus

BROMINE REDUCES MERCURY EMISSIONS BY 90%

Bromine-based products are used to reduce toxic mercury emissions from coal-fired power plants

More than 40% of the world's electricity is generated by coal power plants³. When coal is combusted, various chemicals including mercury (Hg) are released.

Mercury is considered by the World Health Organization (WHO) as one of the top ten chemicals of major public health concern⁴. National laws along with the international Minamata Convention⁵ are pushing countries to find ways to reduce mercury emissions.

The use of bromine in pollution control installations is one of the technologies proven to enhance the reduction of mercury emissions in a cost-effective manner.

Bromine-based compounds are adaptable and can therefore be used at different stages of the process: they can be added to the coal before combustion, brominated activated carbon can also be injected into the flue gas stream after combustion to capture the mercury.

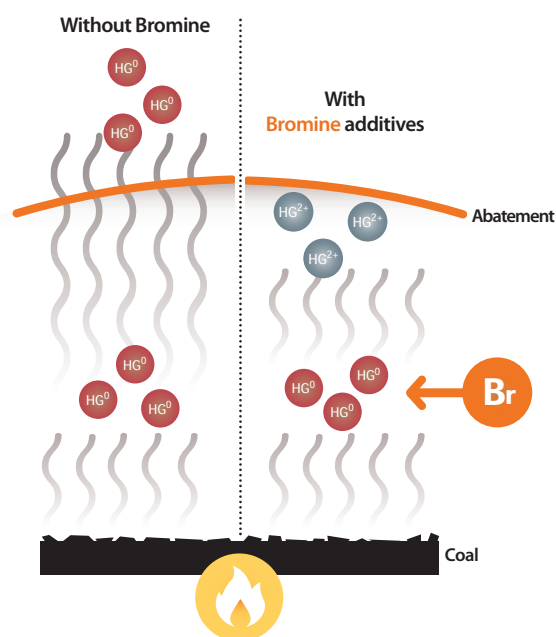
WHY IS BROMINE EFFECTIVE TO COMBAT MERCURY EMISSIONS?

Mercury is released when coal is burnt and takes three forms in the flue gas: oxidized (Hg^{2+}), particulate (Hg^p) and elemental (Hg^0). Elemental mercury is gaseous at combustion temperatures and therefore difficult to capture.

Bromide additives are used to convert the elemental mercury (Hg^0) to oxidized mercury (Hg^{2+}) which can then be captured more easily by emission control equipment.

Coal-fired boilers and power plant installations using this bromine-based technology can achieve **mercury emissions reductions by about 90%⁶.**

After having been captured by emission control equipment, mercury is retrieved and carefully handled.



¹ Gordon W. Gribble, The diversity of naturally occurring organobromine compounds, Chemical Society Reviews, 1999, link

² Billy G. Hudson, et al. Bromine is an essential trace element for assembly of collagen IV scaffolds in tissue development and architecture. Cell, 2014; vol. 157, link

³ International Energy Agency, link

⁴ World Health Organisation, link

⁵ Minamata Mercury Convention, link

⁶ U.S. Government Accountability Office, Mercury Control Technologies at Coal-Fired Power Plants Have Achieved Substantial Emissions Reductions, link

