

[www.bsef.org](http://www.bsef.org)



The International  
Bromine Council

**Bromine  
Powering Science  
and Technologies.**



## ABOUT BSEF

BSEF, the International Bromine Council, is the global organization of the bromine industry promoting the benefits of bromine and bromine technologies for society and economy as well as commissioning science on bromine and bromine-based solutions.

Since 1997 we have been working to foster knowledge on the uses and benefits of bromine-based solutions for society and economy. We strongly believe in science and innovation. Through investments in research and development BSEF members create robust bromine-based technologies meeting the needs of society.

## WHAT WE DO?

- Promote the benefits of bromine and bromine technologies for society and economy
- Commission and disseminate science on bromine and bromine technologies
- Support BSEF members and market organizations in their engagement with policy makers and regulatory authorities
- Represent the bromine technology sector in its engagement with civil society and economic actors

## BSEF MISSION

*Our mission is to be the reference source for information and science on bromine and bromine technologies globally.*

## ABOUT BROMINE

Bromine is part of the halogen group of the periodic table but is probably not as well-known as other elements in this group such as fluorine, used in toothpaste and chlorine, used in swimming pools.

Bromine's chemical symbol is Br. It is a reddish-brown liquid and is never naturally found in its elemental form. Rather it is usually found in inorganic compounds, also known as bromides, and in natural organo-bromine compounds. These are found in soils, salts, air and seawater.

Today, bromine is primarily extracted from seawater, brine wells and salt lakes where the element is especially abundant. Around 600,000 tons of bromine are estimated to be produced annually on a worldwide basis.

Bromine has recently been shown to be one of the 28 essential elements for life where it plays a vital role in tissue development<sup>1</sup>. It is present in the human body like many other elements, though in very small quantities.

<sup>1</sup> Scott et al. 2014. Bromine Is an Essential Trace Element for Assembly of Collagen IV Scaffolds in Tissue Development and Architecture. Cell Volume 157, Issue 6, p1380–1392, 5 June 2014

*“Without bromine, there are no animals”*

Billy Hudson Ph.D -  
Vanderbilt University, 2014

## HISTORY OF BROMINE

Two chemists, the German Carl Jacob Lowig and Frenchman Antoine Balard independently discovered elemental bromine in the 19th century while studying natural salt waters. They crystallized the salts and saturated the remaining liquid with chlorine. What was left after distillation was a dark red liquid: bromine. The earliest uses of bromine were in anti-seizure medications and photographic film production. But today, the largest use of bromine is in fire safety as brominated flame retardants.

## BROMINE APPLICATIONS

Since bromine was discovered in 1826, bromine compounds have been used in diverse applications ranging from water treatment, reduction of mercury emissions from large combustion plants, fire safety, energy storage clear brine fluids used in the extractive industry, production of pharmaceuticals and enhanced quality rubber.

More information on bromine applications can be found at [www.bsef.org](http://www.bsef.org)



### FIRE SAFETY

**Bromine is used for the production of flame retardants, substances that inhibit or slow down the growth of a fire.**

Modern homes and public spaces contain highly flammable materials. Flame retardants are part of the fire safety tool box protecting people and property from fires.

Brominated flame retardants can significantly delay ignition in the early stages of a fire when it can still be extinguished, or occupants of a building can escape.



### MERCURY EMISSIONS REDUCTION

**Bromine is used help coal plants reduce their mercury emissions.**

Mercury is considered a global public health concern and in 2013 The Minamata convention on Mercury committed the global community to addressing and eliminating as far as possible mercury emissions to the environment. More than 40% of the world's electricity is generated by coal power plants. When coal is combusted, mercury (Hg) that is present in the coal may be released.

Bromine-based mercury emission technologies will therefore be part of the solution to meeting the goals of the Minamata Convention.



### WATER TREATMENT

**Bromine based products have been used in water treatment applications to purify and disinfect water since the 1930s.**

Water impurities such as algae, fungi, bacteria and microbes can cause serious threats to both human health and the environment as well as to the safety and effectiveness of industrial processes.

Bromine-based products are ideal solutions for water treatment applications thanks to bromine's ability to kill harmful contaminants by combining with bacteria and other living organisms in water.



## ENERGY STORAGE

**Bromine-based flow batteries are highly efficient in storing and releasing energy, while reducing costs and impact on the environment.**

Managing the global demand for renewable, low carbon energy is one of the greatest challenges in the transition towards a greener, energy-efficient future and low carbon economy. Investment in energy storage is seen as the key to addressing this.

Bromine-based energy storage technologies such as flow batteries can play a vital role here thanks to their properties, scalability and simplicity. Their optimal use will be in facilities, grid storage systems and contributing to grid stability.



## RUBBER

**The addition of bromine to rubber makes the material particularly suited for tyres, and medical stoppers.**

Bromobutyl rubber is derived from combining butyl rubber with bromine. Most commonly used in the automotive industry, butyl rubber has considerable physical strength, low permeability, and is highly shock, weather and age resistant.

Bromobutyl rubber ensures that the product life cycle of the tyre is longer, and contributes to the safety of motorists by avoiding tyre failure.



## PHARMACEUTICALS

**Bromine compounds are used in drugs and as a catalyst for the manufacturing of pharmaceuticals.**

The first known use of bromine for medicinal purposes was back in 1835. Previously used as anti-seizure medication in the 19th and early 20th century, today Bromine-based ingredients are used in many over-the-counter and prescription drugs, as well as a treatment for many differing health problems.

Brominated compounds are often used for the preparation of pharmaceutical products, where it is used as an indispensable catalyst that increases the reaction rate.

## OUR MEMBERS

BSEF champions bromine's many benefits around the world and commissions research that breaks new ground in bromine science. Bromine-based solutions are essential to many of the most important advancements in science and technology.

The members of BSEF are Albermarle Corporation, ICL Industrial Products, Chemtura and Tosoh Corporation.



## FOR FURTHER INFORMATION CONTACT US AT

### **The International Bromine Council**

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