

Critical Minerals for a More Resilient World

Albemarle is a global leader in transforming critical resources into essential ingredients for mobility, energy, connectivity and health. Albemarle provides crucial solutions that enable modern living and are indispensable for advanced manufacturing, national defense and energy security.

Lithium (Li)

Lithium is a critical element that plays a significant role in various aspects of modern life. It is essential for national security and energy independence, serving as a cornerstone in the development of advanced technologies and renewable energy solutions in multiple industries and applications. Furthermore, lithium is indispensable in our daily lives as it is present in countless everyday products, enhancing modern living.

Bromine (Br)

Bromine is essential in various aspects of daily life. It plays a significant role in the safety of our homes and appliances and in the energy intensity of industrial water treatment. Bromine is a common element in flame retardants, and has a wide range of applications, including improving the safety of raw meat and poultry processing, the synthesis of pharmaceuticals and other roles in industries and products that are part of our everyday lives.

APPLICATIONS	ELEMENTS	ALBEMARLE SOLUTIONS	VALUE OF THE ELEMENT
AGRICULTURE & FOOD			
Agrochemicals	Li	<i>Butyllithium, Tools for Synthesis (TFS) reagents</i>	Butyllithium and other reagents are used for the synthesis of agrochemical compounds such as herbicides and fungicides.
Disinfectants	Br	<i>AviBrom®, BoviBrom®, PorciBrom®, SWG Biocide®</i>	Bromine-based disinfectants like AviBrom®, BoviBrom® and PorciBrom® are used as antimicrobials for pathogen reduction in poultry, beef and pork processing. SWG Biocide® is used to disinfect tanks, pumps, piping and tubing associated with water lines in animal, livestock and poultry housing facilities.
Equipment and Machinery	Li	<i>Battery materials (Lithium carbonate, lithium hydroxide, lithium metal, electrolyte salts)</i>	Lithium batteries power heavy machinery, providing efficient and reliable energy.
AUTOMOTIVE & EV			
Air Bag Initiators (specialties grade)	Energetics	<i>Titanium, zirconium</i>	Titanium and zirconium metallurgy and pyrotechnics help safeguard millions of lives every day by enabling reliable air bag initiators.
Automotive Wire and Cable, Connectors and Enclosures	Br	<i>SAYTEX® flame retardants</i>	Flame retardants are used in automotive wires and cables, connectors and enclosures to reduce the risk of fire, enhancing passenger safety.
EV / Hybrid / Plug-In Hybrid EV Batteries	Li	<i>Battery materials</i>	Lithium-ion batteries are essential for electric and hybrid vehicles, providing high energy density and long life cycles.
Plastics	Li, Br	<i>TFS reagents, hydrogen bromide</i>	Organo-magnesium reagents are used to prepare Ziegler-Natta catalysts used for the synthesis of plastics such as polyethylene and polypropylene. Hydrogen bromide is used to regenerate catalysts used in the production of some plastics.
Precision Cleaning	Br	<i>ABZOL®</i>	High-performance cleaning solvents are designed for vapor degreasing, cold and ultrasonic cleaning for sensitive materials such as complex circuit boards, optical equipment, aerospace and automotive parts.
Tires (specialties grade)	Li, Br	<i>Butyllithium, elemental bromine</i>	Lithium compounds and elemental bromine are critical to the rubber and plastics industries. They are used in tire manufacturing to enhance durability and performance.
AEROSPACE & AVIATION			
Commercial Aviation and Aviation Materials	Li, Br	<i>Battery materials, bulk metal lithium, SAYTEX® flame retardants</i>	Lithium is used in various components of aircraft to reduce weight and improve fuel efficiency. Flame retardants are used in aircraft materials to meet stringent fire safety standards, helping ensure passenger safety.
Drones and Electric Vertical Take-Off and Landing (eVTOL)	Li	<i>Battery materials</i>	Lithium batteries provide lightweight and efficient power sources for drones and are critical for the development of eVTOL and drone aircraft, which aim to revolutionize urban air mobility.
Precision Cleaning	Br	<i>ABZOL®</i>	High-performance cleaning solvents are designed for vapor degreasing, cold and ultrasonic cleaning for sensitive materials such as complex circuit boards, optical equipment, aerospace and automotive parts.
Satellites	Li, Br	<i>Battery materials, SAYTEX® flame retardants</i>	Lithium batteries power satellites, ensuring long-term energy supply in space. Additionally, lithium metal is a lightweight material used in aircrafts, transportation vessels, spacecrafts, satellites and more. Flame retardants are used in the fiber optic cables of satellite systems to help prevent fires.
BUILDING & CONSTRUCTION			
(Enamels) Appliances	Li	<i>Lithium carbonate, lithia, spodumene</i>	Lithium compounds are used in coatings for refrigerators, stoves and washing machines to improve performance and longevity.
(Enamels) Glazes and Cookware	Li	<i>Lithium carbonate, lithia, spodumene</i>	Lithium enhances the heat resistance and durability of cookware coatings and is used in the production of cooktop stoves.
Glass and Ceramics	Li	<i>Lithium carbonate, lithia, spodumene</i>	Lithium compounds are used in glazes to improve color, durability, finish and more.
Insulation, Wire and Cable	Br	<i>SAYTEX® flame retardants</i>	Flame retardants are used in building materials such as insulation and electrical cables to reduce fire hazards and improve property safety.

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BUILDING & CONSTRUCTION			
Quick-Setting Cement and Tiles / Adhesives	Li	<i>Lithium hydroxide & others</i>	Lithium additives accelerate the setting time of cement and adhesives. Lithium hydroxide is used to preserve concrete construction materials against adverse reactions.
Road Pavements	Li	<i>Butyllithium</i>	Butyllithium is used to create special road pavements to reduce noise and the abrasion of tires.
Self-Leveling Floors	Li	<i>Lithium carbonate & others</i>	Lithium compounds are used in self-leveling floor materials for their quick-setting properties.
Water Treatment	Br	<i>SANIBROM®, STABROM®, MAXXIS®</i>	Bromine-based biocides are used in cooling towers and water treatment systems to control microbial growth and help ensure clean water.
CONVENTIONAL ENERGY			
Oil and Gas Drilling	Br	<i>WELLBROM®</i>	Bromine-based materials are used in drilling fluids to stabilize boreholes and help prevent blowouts, helping ensure safe and efficient drilling operations.
ELECTRICAL & ELECTRONICS			
Appliances	Br	<i>SAYTEX® flame retardants</i>	Flame retardants are used in electronic devices to help prevent fires caused by overheating or electrical faults, helping ensure user safety.
Chargers, Batteries, E-bikes and Wearable Devices	Li	<i>Battery materials</i>	Lithium-ion technology is the backbone of rechargeable batteries in various electronic devices, providing efficient, lightweight and long-lasting power.
Electronic Device Covers and Advanced Glasses	Li	<i>Lithium carbonate, lithia, spodumene</i>	Lithium compounds are used in the production of durable covers for electronic devices.
Photographic Chemicals	Li	<i>Lithium chloride</i>	Lithium chloride is used in photographic developer solutions.
Robots	Li	<i>Battery materials</i>	Lithium batteries power robots, enabling longer operational times.
Semiconductor Manufacturing	Li, Br	<i>Butyllithium, TFS reagents, anhydrous hydrogen bromide, ABZOL®</i>	Butyllithium & TFS reagents are used in the synthesis of silanes and metal precursors for high-k materials. High-purity anhydrous hydrogen bromide is used for its excellent etching performance and in the production of new-generation chips in the microelectronics industry.
Smartphones, Tablets, Laptops and TVs	Li, Br	<i>Battery materials, SAYTEX® flame retardants, ABZOL®</i>	Lithium-ion batteries power most modern devices, offering long-lasting energy. Flame retardants are used in electronic devices to help prevent fires caused by overheating or electrical faults, helping ensure user safety.
ENVIRONMENTAL TECHNOLOGY			
Mercury Control	Br	<i>Sorbents & additives</i>	Mercury control additives are used to enhance the oxidation of elemental mercury and sorbents to remove mercury vapor that can be present in gas streams.
GRID STORAGE			
Energy / Grid Storage Solutions	Li, Br	<i>Lithium carbonate, SAYTEX® flame retardants</i>	Lithium-based storage solutions improve the efficiency and reliability of energy grids. Flame retardants help protect modern day power supply sources from the hazards of smoke and fire.
Power Grid	Li, Br	<i>Lithium carbonate, SAYTEX® flame retardants</i>	Lithium batteries are used for energy storage in power grids, helping to balance supply and demand. Flame retardants are used to help prevent or slow the spread of fire in wires and enclosures in power grid systems.
Solar Panels	Li, Br	<i>Lithium carbonate, SAYTEX® flame retardants</i>	Lithium batteries store energy generated from solar panels, making renewable energy more reliable. Flame retardants are used in the wire, cable and connectors of solar panels to help prevent fires.
INDUSTRIAL PROCESSES			
Equipment and Machinery	Li, Br	<i>Battery materials, SAYTEX® flame retardants</i>	Lithium batteries power heavy machinery, providing efficient and reliable energy. Flame retardants are used in industrial equipment and machinery to reduce fire risks and enhance safety.
Industrial and Commercial Water Treatment	Br	<i>SANIBROM®, STABROM®, MAXXIS®</i>	Bromine-based biocides are used in cooling towers to prevent microbial growth and maintain efficient operations.
Lubricating Greases	Li	<i>Lithium hydroxide</i>	Lithium greases are used in a wide range of industrial applications for their high performance, including industrial processes for automotive, steel, aircraft and heavy machinery.
Metallurgy	Li	<i>Lithium metal, lithium carbonate, lithium chloride, lithium fluoride</i>	Lithium-containing products are used to improve the physical and chemical properties of metals and alloys, as scavenger for refining copper and other metals, in the continuous casting of steel and as components of salt baths for dip brazing and open furnace soldering.
MEDICAL DEVICES & EQUIPMENT			
Pacemakers	Li	<i>Lithium carbonate, lithium metal foils</i>	Lithium batteries provide long-lasting power for pacemakers, which ensure reliable heart rhythm management.
PHARMACEUTICAL & NUTRITION			
Pharmaceuticals	Li, Br	<i>Lithium carbonate (API), TFS reagents</i>	Lithium is used in the development of new active ingredients, excipients, synthesis routes and medications, such as those for mood disorders, hypertension and HIV treatment. Bromine and bromine-containing materials are used in the synthesis of multiple pharmaceutical drugs.
Vitamins	Li, Br	<i>TFS reagents</i>	Lithium and bromine compounds are used in trace amounts in some vitamin formulations for their potential health benefits.
X-ray Imaging	Energetics	<i>Cesium iodide</i>	Cesium iodide is used in X-ray imaging to improve image contrast and diagnostic accuracy.

Learn more at [albemarle.com](https://www.albemarle.com)

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