



Saudi Standards, Metrology and Quality Organization

(SASO)

Technical Regulation for Fireworks

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Note:

Only the Arabic version of this Regulation is authentic in law and is applicable where there are differences with this translation

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Preamble

In line with the accession of the Kingdom of Saudi Arabia (KSA) to the World Trade Organization (WTO), as per the Decree No. 244 of the Council of Ministers, dated 21/09/1426 A.H., concerning the approval of documentation on the Kingdom's accession to the WTO, and the requirements by which the KSA shall adapt its relevant systems with the principles of WTO agreements, particularly, the Technical Barriers to Trade (TBT), which stipulates that no unnecessary technical requirements shall impede the flow of commodities among the member states, and that technical requirements and methods of conformity assessment shall not discriminate between products on the basis of origin, through the issuance of Technical Regulations that include the essential requirements and standardized business procedures.

In accordance with Article 3 (Clause-1), Statute of Saudi Standards, Metrology and Quality Organization, issued in accordance with the Council of Ministers Decree No. 216, dated 17/06/1431 A.H. (31/05/2010 A.D.), stipulating that: **"SASO shall issue Saudi standards, quality systems and guidelines and conformity assessment, compatible with international standards and guidelines, that meet the requirements of the World Trade Organization (WTO) Agreement, in addition to their compliance with Islamic Sharia and serving the interests of Saudi Arabia";**

In accordance with Article 4 (Clause-2), Statute of Saudi Standards, stipulating that: **"SASO shall issue regulations for conformity assessment procedures of commodities, products, and services according to approved standards";**

In accordance with Article 6 (Clause-1), Statute of Saudi Standards, Metrology and Quality Organization, issued in accordance with the Council of Ministers Decree No. 216, dated 17/06/1431 A.H. (31/05/2010 A.D.), stipulating that: **"Subject to Article 4 of this Statute, SASO shall be the authority in charge of matters related to standards, conformity assessment procedures, granting the quality mark, metrology and calibration. All public and private sectors shall be adhered to the Saudi standards in all purchases".**

Whereas the standards of the products included in a regulation shall be a basis for the conformity of such products with the essential safety requirements included in the specified regulation.

Note: This preamble and all the annexes of this regulation shall form an integral part thereof.

Article (1): Terms and Definitions

- 1/1 When applying the articles of this regulation, terms and expressions hereunder – shall have the meanings indicated in front thereof, unless the context otherwise requires:

KSA: The Kingdom of Saudi Arabia.

SASO: Saudi Standards, Metrology and Quality Organization.

The Board:: SASO's Board of Directors.

Regulatory Authorities: government body/ bodies with regulatory tasks according to their specializations, that are responsible for the implementation and enforcement of technical regulations, whether in customs, markets, or manufactories.

Competent Authority: Government body/bodies in the KSA designated to issue licenses for fireworks products.


Market Surveillance: Activities and measures carried out by the market surveillance authorities to verify that products meet the requirements stipulated in the relevant technical regulations, and to ensure that they do not pose a risk to health, safety, environment, or any other aspect related to the protection of the public interest.

Market Surveillance Authorities: government body/ bodies responsible for carrying out market surveys.

Technical Regulation: A document approved by The Board that provides, the specifications of products, associated processes and production methods, including applicable administrative provisions; with which compliance is mandatory. It may include or pay attention to terms, definitions, packaging, and requirements of markings or labelling products, services, processes or production methods.

Standard: A document approved by the Board that provides, for the regular and recurring use, non-mandatory rules and instructions, and specifications of products or processes and production methods. It may include, or pay attention to terms, definitions, packaging, and requirements of markings or labelling products, services, processes or production methods.

Essential Requirements: The special requirements of the products; that may affect the safety, health, and the environment; that must be adhered to.

 **Hazard(s):** A potential source of harm.

Risk (s): A potential risk causing damage; associated with the severity of damage.

Supplier:

- A product manufacturer, in case that he is resident in the KSA, or the person identified as the manufacturer of the product, through linking the product to their name, or to a relevant commercial description, or any person who provides a product replacement.
- An agent, when the manufacturer is resident outside the Kingdom or an importer in the absence of an agent of the manufacturer.
- Any person in the supply chain, whose activities may affect the product characteristics.

Conformity Assessment Procedures: A document approved by the Board of Directors, which describes the procedures used directly, or indirectly for the conformity assessment.

Notified (Approved) Bodies: Conformity Assessment Bodies “Third Party”, approved by SASO in accordance with the regulation of approving Conformity Assessment Bodies.

Certificate of Conformity: A certificate issued by SASO or a notified body, which ensures the conformity of a product, or any batch thereof, with the requirements of relevant standards.

Supplier Declaration of Conformity: A declaration by the supplier by which it declares that a product conforms to the requirements herein and applicable legislations, without the mandatory intervention of a third party neither in the design stage, nor in the production stage of the manufacturing process. A declaration may depend on testing the product in accordance with the relevant legislation.

Saudi Quality Mark: A mark granted by SASO, which declares that the supplier has established an effective management system, which ensures that the products they supply are produced in accordance with the applicable regulations, granting procedures, and the relevant Saudi standards.

Making Available on the Market: Any supply of the product for distribution, consumption or use in the KSA, in the course of a commercial activity, in return for payment or free of charge.

Withdrawal: Any procedure that aims to prevent a product from being placed in the market or in a supply chain.



Recall: Any procedure that aims to recall products made available for the end-user.

Product: Fireworks.

Noise: It is the sound produced when fireworks are used and is measured in decibels (dB).

Fireworks: Any chemical substance, compound or mixture, in its gaseous, liquid or solid state, that is intended to cause a cracking sound accompanied by auras, light or smoke forms, or a combination thereof.

- 1/2 The terms and expressions specified herein shall have the meanings specified in the applicable laws, regulations, and decrees of SASO.

Article (2) Scope

Fireworks used in celebrations and festivals that are used only by people with specialized knowledge known as (fireworks for professional use) and their products are described in Annex (1).

Article (3) Objectives

This regulation aims to layout the essential requirements for fireworks included in the scope of this Technical Regulation, and to identify the conformity assessment procedures with which the suppliers shall comply to ensure environmental preservation and the health and safety of the consumer.

Article (4) Obligations of Supplier

The supplier shall adhere to the following requirements:

4/1 Essential Requirements

- A) The necessary permits shall be obtained from the competent authority to manufacture, import, transport and store fireworks.
- B) Fireworks shall be suitable for the purpose of which they were designed for, taking into account, in particular, the health and safety of all personnel and stakeholders involved in the manufacture, transport, handling, storage and display of fireworks.
- C) The body or outer shell of the fireworks shall be made of paper, cardboard, or plastic.

4/2 Technical Requirements

- A) Fireworks products shall meet all the technical requirements specified in the standards set out in Annex No. (1) of this regulation: (manufacturing

requirements - packaging requirements - storage and trading requirements - metrological requirements).


- B) Availability of an effective environmental management system at the manufactory. The factory holding an environmental management system certificate according to the international standard ISO 14001 shall be deemed as met the requirements of this item.

Article (5) Labelling

Fireworks labels shall include the following requirements:

- 5/1 The labels on the product packaging shall be in conformity with the requirements of mentioned in this regulation and the relevant standards mentioned in Annex No. (1) of this Technical Regulation.
- 5/2 The label shall include warnings, usage instructions, and expiration date, and they shall be written clearly and in an irremovable way.
- 5/3 The labels shall be written in Arabic or Arabic and English.
- 5/4 All information used in the labels shall be valid and verified.
- 5/5 Images and phrases used on the product packaging shall not violate the public law, morals, and the Islamic values prevailing in KSA.

Article (6) Fireworks Supply Procedures

- 6/1 The supplier shall obtain the necessary licenses from the competent authorities.
- 6/2 A statement of safety precautions shall be provided.
- 6/3 The type and categories of fireworks shall be determined according to the relevant standards and the registration number at the competent authority.
- 6/4 The supplier shall prepare a record of all the names and addresses of local agents licensed to practice fireworks activity, and provide them with copies of the Certificates of Conformity and any other documented information proving that the product conforms to the requirements of this regulation, upon request.
- 6/5 The supplier shall provide the beneficiaries with copies of instructions and periodic publications issued by the competent authorities, which include usage instruction of the fireworks and the times allowed.
- 6/6 The supplier shall cooperate with the competent, regulatory, and market surveillance authorities by providing them with all the names and addresses of the local agents for inspection and follow-up purposes.
- 6/7 The schedule of the relationship between the composition and the chromatic  effect of the chemicals used in the installation of fireworks described in Annex

(4) shall be adhered to, and if other materials are used, they shall be identified and documented in the factory records.

Article (7) Conformity Assessment Procedures

- 7/1 The supplier shall obtain a Certificate of Conformity issued by an accredited body by SASO, in accordance with the conformity assessment model (Type 3) as per standard ISO/IEC 17067 as shown in Annex (2).
- 7/2 The Notified (Approved) Body shall implement the conformity assessment procedures according to the specified model, in order to ensure fulfillment of the requirements of the Technical Regulation and relevant Saudi standards set out in Annex (1) of this Regulation..
- 7/3 The product shall be accompanied by a technical file, which includes the following:
 - A) Supplier (manufacturer/importer) Declaration of Conformity in accordance with the attached form in Annex (3)
 - B) Risk Assessment Document.
- 7/4 The supplier shall cooperate with the competent, regulatory, and market surveillance authorities, by providing the technical file documents and Certificates of Conformity, and any other documents proving the conformity of the product with the requirements of this regulation, upon request.
- 7/5 Fireworks that bear the Saudi Quality Mark or its equivalent shall be deemed in conformity with the requirements stipulated in this regulation.

Article (8) Responsibilities of Regulatory Authorities

Regulatory Authorities, as a part of their competences, shall carry out the following:

- 8/1 Verify fulfillment of fireworks products to the requirements of the specified conformity assessment procedures and the technical documents accompanied with the consignments.
- 8/2 Randomly, take samples of fireworks, and refer such samples to the competent laboratories to ascertain the extent of the conformity of such sample with the requirements set out in this Technical Regulation
- 8/3 The suppliers shall bear the costs of tests and associated fees.
- 8/4 In case of a non-conformity of the product, coordination shall be made with the competent authority to withdraw the concerned products from warehouses, and take the necessary legal actions.
- 8/5 Issuing instructions and periodic publications in the event of public or private occasions about the places and times when fireworks are permitted.

Article (9) Responsibilities of Market Surveillance Authorities

Market Surveillance Authorities, as a part of their competences, shall carry out the following:

- 9/1 Enforce the market surveillance procedures to the products stored – by virtue of a license from the competent authority - in warehouses, in order to check the safety of the product and the extent of fulfillment of the requirements stipulated in this Technical Regulation and relevant standards.
- 9/2 Withdraw samples of the product from the warehouses of suppliers (manufacturers and importers), in order to conduct the necessary tests and to verify the conformity of such products with the requirements set out in this Technical Regulation.
- 9/3 In case of non-conformity of – displayed or stored – products with the requirements of this Technical Regulation, Market Surveillance Authorities shall take all administrative actions including withdrawal and recall of such products. Procedures and penalties – stipulated in Article (10) – shall be applied after taking the necessary actions.

Article (10) Violations and Penalties

- 10/1 It is prohibited to manufacture, import and use unlicensed products that do not conform to the provisions of this regulation, or even advertise them.
- 10/2 Failure to meet the requirements of this Regulation shall be a sufficient reason for the competent authorities, Regulatory and Market Surveillance Authorities to consider the product as non-conforming, which may pose a risk to the health and safety of consumers and to the environment.
- 10/3 In case of a violation of the provisions hereof, Market Surveillance Authorities shall take all necessary actions to eliminate such violations, and their effects from the market. To this end, Market Surveillance Authorities may:
 - A) Mandate the violating party – that is responsible for placing and offering of the product – to withdraw the product from the warehouses or markets in order to remedy such violations, if possible. The product may be exported or destroyed (according to the nature of the product) within the period specified by the competent authorities and the Market Surveillance Authorities.
 - B) Withdraw, restrain or destroy the products, or take any other necessary action to recall such products from the markets. In addition, as the case may be, Market surveillance Authorities may announce the withdrawal of the product from the markets, and the violating party shall bear all associated expenses. In case of non-conformity of the products, SASO

shall take the necessary actions concerning products non-conforming with the requirements of this Regulation, including the cancellation of the relevant Certificate of conformity, while taking the necessary measures with the Notified body, which issued the certificate.

- 10/4 Without prejudice to any other law, a party that violates any of the provisions hereof shall be subject to the penalties stipulated in applicable Anti-Commercial Fraud Law or any other superseding law.

Article (11) General Provisions

- 11/1 Supplier shall bear full legal responsibility for the implementation of the requirements of this Technical Regulation, and shall be subject to the penalties stipulated in the Anti-Commercial Fraud laws and/or any other related laws, in case any violation of the articles thereof is proven.
- 11/2 This Technical Regulation shall not impede the supplier to comply with all other systems/regulations applicable in the KSA; pertaining to trading, transporting, or storing the product, in addition to the rules/regulations related to the environment, security, and safety.
- 11/3 Suppliers of fireworks subject to the provisions of this Technical Regulation shall provide the inspectors of the competent authorities, regulatory authorities, and market surveillance authorities with all necessary information and facilities, when required, to carry out their assigned tasks.
- 11/4 If new originated cases that cannot be treated under the provisions of this Technical Regulation, or a dispute arises as a result of the application of those provisions, such matter shall be referred to the competent committee in SASO, in order to issue a proper resolution regarding the case or dispute, while taking the public interest into consideration.
- 11/5 SASO shall examine the complaints received regarding the products having a Certificate of Conformity or a Quality Mark, if any, and verify the validity of such complaints, and take the necessary legal actions in case of any violations.
- 11/6 SASO have the right to annul the Certificate of Conformity or the Quality Mark license, if any, if the supplier violates the provisions herein, and shall take the legal actions to ensure the preservation of the rights of SASO.
- 11/7 If any modifications were made to the product during the validity period of the Certificate of Conformity or the Quality Mark license, if any, (except for figure modifications), the certificate, or license for this product shall be annulled, and a new request shall be submitted



- 11/8 SASO shall, exclusively, have the right to interpret the articles herein. All beneficiaries of the application of this Technical Regulation shall adhere to the interpretations issued by SASO.

Article (12) Transitional Provisions

- 12/1 The supplier shall adhere to the provisions of this Technical Regulation within a period of ninety days from the date of publication in the Official Gazette.
- 12/2 It is prohibited to trade infringing products after 6 six months from the date of publication.
- 12/3 This Technical Regulation, once enforced, shall supersede all the preceding regulations related to the scope of conformity of fireworks products to the safety requirements prior to trading and during use.
- 12/4 This regulation shall be canceled from the date of their entry into force of all the previous regulations in the field of matching fireworks products with safety requirements before they are circulated and during their use.

Article (13) Publication

This Technical Regulation shall be published in the Official Gazette.



Annex No. (1)**A) List of Standards for Fireworks Products**

No.	Product	Standard Title	Standard No.
1	Fireworks	Manufacture code, transportation, warehousing and retail sales of fireworks and explosives	NFPA – 1124
2	Fireworks	Fireworks presentation code	NFPA – 1123
3	Fireworks	Specification for the use of fireworks directly in front of the fans	NFPA – 1126
4	Fireworks	Fireworks - Category 4 - Part 2: Requirements - Requirements for installation, performance, and packaging of Class 4 fireworks.	ISO 26261-2: 017
5	Fireworks	Prepare safety releases and use basic safety releases and a range of safety releases	SASO-IEC-GUIDE-104
6	Fireworks	Fire Safety - Vocabulary	SASO-ISO-13943
7	Fireworks	Industrial health and safety regulations - Hazardous materials - Flammable liquids - Part 4: Service stations, factories, refineries and chemical plants	SASO-349

Note: The list of standard mentioned in this appendix is subject to review, and suppliers are responsible for ensuring that they are using the latest/updated version of those mentioned in the lists.

B) List of HS Codes for Products Subject to this Regulation

fireworks regulation	HS Code
Games intended for celebrations and festivals	3604
	9505

Note: The products and customs codes found on the Saber E-platform are the updated and approved version.

Annex No. (2)**Conformity Assessment Form (Type 3) as per ISO/IEC 17067****(Type Approval Based on Quality Assurance of Production Process)****1 Type Approval Based on Quality Assurance the Production Process**

A model of conformity assessment procedures, by which the supplier fulfills the obligations set out in the items below, while ensuring and acknowledging - on its sole responsibility - that the concerned products are in conformity with the type specified in the Type Approval Certificate and comply with the requirements of the relevant technical regulations.

2 Manufacturing

The supplier shall operate with a certified Product Safety Management System, to ensure the safety of the product, including production lines, final inspection and testing of the concerned products as per Clause (3), and shall be subject to periodic surveillance as per Clause (4).

3 Product Safety Management System

- 3/1 The supplier shall submit a request to a Notified Body "Third party" of its choice, in order to evaluate the safety management system of concerned products.

The request shall include:

- A) Name and address of the supplier, and the name and address of the official representative, in case the representative submits the request.
- B) The manufacturer shall be officially licensed by the relevant authorities in the country of origin.
- C) A written declaration not to submit the same request to any other Notified Body "Third Party".
- D) All relevant information regarding the concerned product category.
- E) Documentation of the Product Safety Management System.
- F) Technical documents of the certified type, and a copy of the Type Approval Certificate.

- 3/2 The Product Safety Management System shall guarantee that the manufactured products are in conformity with the type specified in the Type Approval Certificate, and with the requirements of the relevant technical regulations.

- 3/3 All the system elements and its requirements - adopted by the supplier - shall be documented in a systematic and orderly manner in a form of written policies, procedures and instructions. The documents of the Product Safety

Management System shall provide a consistent understanding of the safety programs, plans, manuals and records. Such documents shall contain, in particular, an adequate description of the following:

- A) Quality objectives, organizational structure, responsibilities and competences of the management regarding the safety of the product.
- B) Manufacturing techniques, product safety and quality assurance procedures, and applied processes and procedures.
- C) Executed inspections and tests; before, during, and after manufacturing, and the frequency with which they will be carried out.
- D) Records: such as inspection, testing, calibration reports, and the qualification documents of relevant personnel, etc.
- E) Means of control for achieving the required product safety and the effective operation of the Product Safety Management System.

- 3/4 The Notified Body, approving the Product Safety Management System, shall assess such system to determine whether it satisfies the requirements referred to in Clause (3/3), during the period of the approval of the system, which shall be three years.
- 3/5 The product shall be presumed to comply with the requirements of the technical regulations, in relation to the items of the Product Safety Management System, whenever it conforms to the standards.
- 3/6 In addition to experience in the relevant product safety, the auditing team shall have one technical expert - at least – who is experienced in the assessment of the field and techniques of manufacturing of the product, and is fully aware of the technical requirements stipulated in the relevant technical regulations.
- 3/7 The audit shall include an assessment visit to the factory. The auditing team shall review the technical documents referred to in Clause (3/3), in order to verify the manufacturer's ability to identify the requirements of the technical regulations and carry out the necessary examinations and tests to ensure compliance of the product with these requirements.
- 3/8 The manufacturer shall be notified of the decision after the end of the assessment, provided that such notice include audit findings, assessment decision, along with the justifications on which the decision was based.
- 3/9 The manufacturer shall be committed to satisfy the obligations of the Product Safety Management System, as approved, and to maintain the system so that it remains adequate and efficient.
- 3/10 The manufacturer shall notify the conformity assessment body, which approved the Product Safety Management System, of any proposed modifications to the system.



- 3/11 The Notified Body shall evaluate any proposed modifications and decide whether the modified Product Safety Management System will continue to satisfy the requirements referred to in Clause (3/3) or a reassessment is necessary. The Notified Body shall notify the manufacturer of its decision; the notification shall include testing results along with the justifications of the assessment decision.

4 Periodic Surveillance under the Responsibility of the Notified Body

- 4/1 The purpose of periodic surveillance is to verify the extent of which the supplier meets the obligations of the certified Product Safety Management System.
- 4/2 For assessment purposes, the supplier shall allow the Notified Body, during the validation period, to enter the manufacturing, inspection, testing and storage sites. The supplier shall provide the Notified Body with all necessary information, particularly, the Product Safety Management System documents and safety records, such as testing and calibration reports, and the qualification documents of relevant personnel, etc.
- 4/3 The Notified Body shall carry out periodic audit visits to verify that the manufacturer applies and maintains the Product Safety Management System, and shall provide the supplier with an audit report.
- 4/4 The Notified Body have the right to perform unexpected visits to the factory. During such visits, the Notified Body may, as necessary, carry out product tests, or have them carried out by a third party, in order to verify that the Product Safety Management System is properly functioning. The Notified Body shall provide the supplier with an assessment report, and testing reports, in case of testing.

5 Certificate of Conformity and Declaration of Conformity

- 5/1 The Notified Body shall issue a Certificate of Conformity for the product in case the supplier has an effective and certified Product Safety Management System, upon the request of the supplier, within the validity period.
- 5/2 The Notified Body shall identify the product details in each request, clarify such details in the issued Certificate of Conformity, and record them in the electronic portal for conformity (in SASO).
- 5/3 The supplier shall provide a written Declaration of Conformity for each approved product type (Type Approval), and shall put it at the Regulatory Authorities and Market Surveillance Authorities disposal for a period of ten (10) years, at least, after the placement of the product in the market. The Declaration of Conformity of the supplier shall identify the approved product type. Furthermore, a copy of the Certificate of Conformity and the Declaration



of Conformity shall bat the Regulatory Authorities and Market Surveillance Authorities disposal request.

5/4 The supplier shall put the following documents at the Regulatory Authorities and Market Surveillance Authorities disposal, for a period of ten (10) years, at least, after placement of the product in the market:

- Documentation referred to in Clause (3/3).
- The amendments referred to in Clause (3/9), as approved.
- Decisions and reports of the Notified Body, referred to in Clause (3/7).

5/5 Each Notified Body shall inform the Regulatory Authorities and Market Surveillance Authorities of issued or withdrawn Product Safety Management System approvals, and shall periodically or upon request, provide lists of Product Safety Management System approvals that have been rejected, suspended, or restricted by any means; on a regular basis or upon request. Each Notified Body shall inform, upon request, the other Notified Bodies of Product Safety Management System approvals it has rejected, suspended, withdrawn, or restricted; and notify such bodies of Product Safety Management System approvals issued by it.



Annex No. (3)**Supplier Declaration of Conformity Form**

This form shall be filled in on the company's official papers.

1) Supplier Details

- Name: _____
- Address: _____
- Contact person: _____
- E-mail: _____
- Phone number: _____
- Fax: _____

2) Product details:

- Trade mark of the product: _____
- Model: _____
- Product description: _____
- The level: _____ The category: _____
- Reference standards / The technical standards: _____

We, hereby, acknowledge that the product abovementioned in this declaration is in conformance with the Saudi technical regulation (_____), and the Saudi standards\----- attached thereto.

- Person in Charge: -----
- Name of the Company: -----
- Signature: -----
- Date: --/--/----



Annex No. (4)

**The relationship between composition and chromatic effect of the chemicals
used**

Fireworks Applications	Name	Code
It adds a silver and white color in addition to the effect of sparks, as it is a major component of sparks	Aluminum	Al
It gives a green color, and is useful for fixing other volatile elements.	Barium	Ba
A major component of black powder, which is used as a propellant and fuel, in the form of charcoal powder or carbon black.	Carbon	C
Other components are darkened, and their salts give an orange color in fireworks.	Calcium	Ca
Oxidized, as many of the mineral salts that are released in color contain chlorine in its composition.	Chlorine	Cl
It helps oxidize the mixtures of fireworks combinations, and gives a dark blue color.	Cesium	Cs
It gives blue color.	Copper	Cu
Spark emission, glow color is controlled by temperature.	Iron	Fe
It helps in oxidizing the mixtures of fireworks combinations, as nitrate salts, chlorate and potassium per-chlorate are important oxidizers, and it adds a violet color to the sparks.	Potassium	k
In order to give a red color, especially the lithium carbonate compound.	Lithium	Li
It burns glow white, so it is used to shape sparks, and to improve the overall fireworks brilliance.	Magnesium	Mg
Sodium gives a golden yellow color, but the strong glow sometimes overshadows the weaker colors.	Sodium	Na
It is used in the composition of oxidants, which are often nitrate, chlorate or per-chlorate salts.	Oxygen	O
It automatically burns in the air in the form of glare in the dark effects of fireworks; it can also be composed of fuel components.	Phosphor	P
It helps oxidize firework mixtures, and gives its salts a red-purple color.	Rubidium	Rb
It enters as a component in black powder fuel	Sulfur	S
Impart a sparkle effect	Antimony	Sb
It gives red color and its salts are important for fixing firework mixtures	Strontium	Sr
It can be burned as powder or small pieces to give silver sparks.	Titanium	Ti
Give a smoke effect in fireworks.	zinc	Zn