**MANUFACTURE AND USES**

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| --- |
| **Substance Name:** phosphorus  **EC Number:** 231-768-7  **CAS Number:** 7723-14-0  **Registrant's Identity:** JS member Legal Entity |

2. MANUFACTURE AND USES

2.1. Manufacture

**Table 6. Manufacture**

| **Identifiers** | **Use descriptors** | **Other information** |
| --- | --- | --- |
| M-1: Production of elemental phosphorus in ferro-phosphorus alloys (massive form) | **Environmental release category (ERC):**  ERC 1: Manufacture of substances  **Process category (PROC):**  PROC 2: Use in closed, continuous process with occasional controlled exposure  PROC 3: Use in closed batch process (synthesis or formulation)  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 25: Other hot work operations with metals |  |
| M-2: Production of elemental phosphorus in ferro-phosphorus alloys (powder form) | **Environmental release category (ERC):**  ERC 1: Manufacture of substances  **Process category (PROC):**  PROC 2: Use in closed, continuous process with occasional controlled exposure  PROC 3: Use in closed batch process (synthesis or formulation)  PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 26: Handling of solid inorganic substances at ambient temperature |  |

**Table 7. Manufacturing process related to the specified manufacture(s)**

| **Related manufacture(s)** | **Description of manufacturing process** |
| --- | --- |
| M-1: Production of elemental phosphorus in ferro-phosphorus alloys (massive form) | Elemental phosphorus contained in ferro-phosphorus -  Ferro-phosphorus is a by-product of the production of white phosphorus (P4) in an electric (submerged) arc furnace. Raw materials are phosphate pellets, silica gravel and dried coke. During the phosphorus reaction, the feed mixture is converted into gaseous product (mainly P4 and CO) and a liquid calcium silicates slag (CaSiO3 and Ca4Si2O7F).  In addition, a second liquid product, known as ferro-phosphorus, is also produced. Iron oxides contained in the phosphate ore are reduced to metallic iron which reacts with the P4 to form ferro-phosphorus.  The ferro-phosphorus with its high specific gravity collects in the bottom of the furnace and is tapped daily, collected in a sand bed and cooled with water and air. |

No information available on production of articles covered by the specified use(s)

2.2. Identified uses

**Table 8. Uses at industrial sites**

| **Identifiers** | **Use descriptors** | **Other information** |
| --- | --- | --- |
| IW-1: Use of ferro-phosphorus lumps during steel and special steel manufacture | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 25: Other hot work operations with metals  PROC 26: Handling of solid inorganic substances at ambient temperature  PROC 2: Use in closed, continuous process with occasional controlled exposure  PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 14: Manufacture of basic metals, including alloys  SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment  **Technical function of the substance during formulation:**  base metal and alloys | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-1: Use of article made of steel containing phosphorus |
| IW-2: Preparation of ferro-phosphorus lumps sample for laboratory purposes | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 26: Handling of solid inorganic substances at ambient temperature  PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 0: Other: Preparation of samples for lab testing  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 0: Other: Laboratory analysis  **Technical function of the substance during formulation:**  alloying element | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: no |
| IW-3: Production of steel and iron | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 13: Treatment of articles by dipping and pouring  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 14: Manufacture of basic metals, including alloys  **Technical function of the substance during formulation:**  Improves mechanical properties of metallic alloys | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-1: Use of article made of steel containing phosphorus |
| IW-4: Manufacturing of alloying tablets and briquettes | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 25: Other hot work operations with metals  PROC 26: Handling of solid inorganic substances at ambient temperature  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 14: Manufacture of basic metals, including alloys  **Technical function of the substance during formulation:**  Improves mechanical properties of metallic alloys | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: no |
| IW-5: Production of stainless or special steels | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 13: Treatment of articles by dipping and pouring  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 14: Manufacture of basic metals, including alloys  **Technical function of the substance during formulation:**  Improves mechanical properties of metallic alloys | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-2: Production of stainless or special steels |
| IW-6: Foundry | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 14: Manufacture of basic metals, including alloys  **Technical function of the substance during formulation:**  Improves mechanical properties of metallic alloys | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-3: Foundry |
| IW-7: Use of ferro-phosphorus powder in paint | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 3: Use in closed batch process (synthesis or formulation)  PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises  PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)  PROC 7: Industrial spraying  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 10: Roller application or brushing  PROC 13: Treatment of articles by dipping and pouring  PROC 26: Handling of solid inorganic substances at ambient temperature  **Product Category used:**  PC 9a: Coatings and paints, thinners, paint removes  **Sector of end use:**  SU 15: Manufacture of fabricated metal products, except machinery and equipment  SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment  **Technical function of the substance during formulation:**  Plating agents and metal surface treating agents | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-4: Coated surface |
| IW-8: Use of ferro-phosphorus in concrete | **Environmental release category (ERC):**  ERC 5: Industrial use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 2: Use in closed, continuous process with occasional controlled exposure  PROC 3: Use in closed batch process (synthesis or formulation)  PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)  PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 26: Handling of solid inorganic substances at ambient temperature  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 13: Manufacture of other non-metallic mineral products, e.g. plasters, cement  **Technical function of the substance during formulation:**  shrinkage control agent | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-5: Cement |

**Table 9. Uses by professional workers**

| **Identifiers** | **Use descriptors** | **Other information** |
| --- | --- | --- |
| PW-1: Use of ferro-phosphorus powder in paint | **Environmental release category (ERC):**  ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix  ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 3: Use in closed batch process (synthesis or formulation)  PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises  PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)  PROC 7: Industrial spraying  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 10: Roller application or brushing  PROC 13: Treatment of articles by dipping and pouring  PROC 26: Handling of solid inorganic substances at ambient temperature  **Product Category used:**  PC 9a: Coatings and paints, thinners, paint removes  **Sector of end use:**  SU 15: Manufacture of fabricated metal products, except machinery and equipment  SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment  **Technical function of the substance during formulation:**  Plating agents and metal surface treating agents | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-4: Coated surface |
| PW-2: Use of ferro-phosphorus in concrete | **Environmental release category (ERC):**  ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix  ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix  **Process category (PROC):**  PROC 2: Use in closed, continuous process with occasional controlled exposure  PROC 3: Use in closed batch process (synthesis or formulation)  PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises  PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)  PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 26: Handling of solid inorganic substances at ambient temperature  **Product Category used:**  PC 7: Base metals and alloys  **Sector of end use:**  SU 13: Manufacture of other non-metallic mineral products, e.g. plasters, cement  **Technical function of the substance during formulation:**  shrinkage control agent | Substance supplied to that use:  In a mixture  Subsequent service life relevant for that use: yes  Link to the subsequent service life:  A-5: Cement |

**Table 10. Article service life**

| **Identifiers** | **Use descriptors** | **Other information** |
| --- | --- | --- |
| SL-1: Use of article made of steel containing phosphorus | **Article category related to subsequent service life (AC):**  AC 7: Metal articles  AC 1: Vehicles  AC 2: Machinery, mechanical appliances, electrical/electronic articles  **Exposure related description of article:**  Articles with foreseeable exposure to dust and fumes during maintenance and recycling processes, e.g. abrasive surface cleaning, dismantling and milling  **Environmental release category (ERC):**  ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release  ERC 12a: Industrial processing of articles with abrasive techniques (low release)  ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release  ERC 12b: Industrial processing of articles with abrasive techniques (high release)  **Process category (PROC):**  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  **Technical function of the substance during formulation:**  alloying element | Article used by:  workers |
| SL-2: Production of stainless or special steels | **Article category related to subsequent service life (AC):**  AC 7: Metal articles  AC 01: Other (non intended to be released): Steel, slabs, plates  **Exposure related description of article:**  Articles with foreseeable exposure to dust and fumes during maintenance and recycling processes, e.g. abrasive surface cleaning, dismantling and milling  **Environmental release category (ERC):**  ERC 12a: Industrial processing of articles with abrasive techniques (low release)  ERC 12b: Industrial processing of articles with abrasive techniques (high release)  **Process category (PROC):**  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  **Technical function of the substance during formulation:**  Improves mechanical properties of metallic alloys | Article used by:  workers |
| SL-3: Foundry | **Article category related to subsequent service life (AC):**  AC 2: Machinery, mechanical appliances, electrical/electronic articles  AC 7: Metal articles  **Exposure related description of article:**  Articles with foreseeable exposure to dust and fumes during maintenance and recycling processes, e.g. abrasive surface cleaning, dismantling and milling  **Environmental release category (ERC):**  ERC 12a: Industrial processing of articles with abrasive techniques (low release)  ERC 12b: Industrial processing of articles with abrasive techniques (high release)  ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release  ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release  **Process category (PROC):**  PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting  PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  **Technical function of the substance during formulation:**  Improves mechanical properties of metallic alloys | Article used by:  workers |
| SL-4: Coated surface | **Article category related to subsequent service life (AC):**  AC 2: Machinery, mechanical appliances, electrical/electronic articles  AC 7: Metal articles  **Exposure related description of article:**  surface coating of metallic articles  **Environmental release category (ERC):**  ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release  ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release  **Process category (PROC):**  PROC 21: Low energy manipulation of substances bound in materials and/or articles  PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles  PROC 25: Other hot work operations with metals  **Technical function of the substance during formulation:**  Plating agents and metal surface treating agents | Article used by:  workers |
| SL-5: Cement | **Article category related to subsequent service life (AC):**  AC 4: Stone, plaster, cement, glass and ceramic articles  **Exposure related description of article:**  Articles with foreseeable exposure to dust and fumes during maintenance and recycling processes, e.g. abrasive surface cleaning, dismantling and milling  **Environmental release category (ERC):**  ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release  ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release  **Process category (PROC):**  PROC 14: Production of preparations or articles by tabletting, compression, extrusion, pelletisation  PROC 21: Low energy manipulation of substances bound in materials and/or articles  **Technical function of the substance during formulation:**  shrinkage control agents | Article used by:  workers |

2.3. Uses advised against

No information available