38.01 - Artificial graphite; colloidal or semi-colloidal graphite; preparations based on graphite or other carbon in the form of pastes, blocks, plates or other semi-manufactures.

3801.10 - Artificial graphite

3801.20 - Colloidal or semi-colloidal graphite

3801.30 - Carbonaceous pastes for electrodes and similar pastes for furnace linings

3801.90 – Other

(1) **Artificial graphite** (electro-graphite) is a variety of carbon, usually prepared in an electric furnace by heating a mixture of finely ground coke (normally petroleum coke, but sometimes anthracite coke, retort coke, pitch coke, etc.) and carbonaceous binders (e.g., pitch or tar), to a sufficiently high temperature (2500 to 3200 ºC) to ensure its " graphitisation " under the catalytic action of substances present in the mixture (e.g., silica or iron oxide). The mixture is first extruded or moulded under pressure into " green " blocks of square or circular cross-section; these blocks may either be pre-fired (baked) at about 1000 ºC and then graphitised, or they may be submitted directly to the graphitisation process.

In this way, a product is obtained with an apparent specific gravity of about 1.5 to 1.6 and a homogeneous microcrystalline structure which X-ray examination shows to be that of graphite. Chemical analysis confirms that the substance is graphite (precipitation of graphitic acid).

In addition to ordinary grades of artificial graphites, the heading includes :

(a) **Nuclear grade artificial graphite**, that is, specially prepared artificial graphite which has a boron content of not more than one part per million, and a total thermal neutrons absorption microscopic cross-section of not more than 5 millibarns per atom. This grade has a very low ash content (not exceeding 20 parts per million), and is used as a moderator or reflector in nuclear reactors.

(b) **Impregnated or impervious artificial graphite**, that is, artificial graphite which, in order to increase its apparent specific gravity or its impermeability to gases, has first been impregnated in a vacuum with tars or resins or with solutions of sugars or other organic products, and re-fired to graphitise the carbonaceous residues of these additives.

The impregnation process may be repeated several times to obtain a higher apparent specific gravity (1.9 or more) or high degree of impermeability. Impregnated graphite may also be of nuclear grade.

Artificial graphite of this heading is usually in the form of powder, flakes, blocks, plates, bars, rods, etc. The blocks and plates are used, after cutting and high-finish machining (fine tolerances and appropriate surface finish), to make the brushes or other electrical carbon articles of heading 85.45 or parts of nuclear reactors.

The heading also includes scrap, waste and worn-out articles, suitable only for the recovery of artificial graphite.

The heading does not cover :

(a) Natural graphite (**heading 25.04**).

(b) Retort carbon (or gas carbon), sometimes incorrectly called " artificial graphite " (**heading 27.04**).

(c) Artificial graphite surface-worked, surface-finished, cut to special shapes, lathe-worked, drilled, milled, etc., or transformed into articles. If of a kind used for non-electrical purposes these usually fall in **heading 68.15** (e.g., filters, discs, bearings, moulds, acid-resistant bricks, etc.); those of a kind used for electrical purposes fall in **heading 85.45**.

(d) Refractory goods, fired as ceramics, with a basis of artificial graphite (**heading 69.02** or **69.03**).

(e) Blocks, plates, bars and similar semi-manufactures, of artificial graphite which also contain powders of silver (**heading 71.06**).

(2) **Colloidal or semi-colloidal graphite.**

(a) **Colloidal graphite** consists of finely divided natural or artificial graphite in colloidal suspension in water or in other media (e.g., alcohol, mineral oil), to which may be added small quantities of other products such as tannin or ammonia for the purpose of stabilising the suspension. Colloidal graphite is usually semi-liquid, and is mainly used for the manufacture of lubricating preparations or for its high electrical conductivity.

(b) **Semi-colloidal graphite** (i.e., graphite in semi-colloidal suspension in water or in other media). Semi-colloidal graphite may be used for the preparation of graphited oils or for forming graphited surfaces.

This category covers only graphite in colloidal or semi-colloidal suspension in any media, the graphite being the basic constituent.

(3) **Preparations based on graphite or other carbon in the form of pastes, blocks, plates or other semi-manufactures.**

(a) **" Carbon " blocks, plates, bars and similar semi-manufactures of metallo-graphitic or other grades.**

These terms cover a group of semi-manufactures such as blocks, plates, etc., of the kind used to make " carbon " brushes for electrical or electrotechnical machinery or appliances, and which are based on carbonaceous materials (alone or compounded with other substances). They are generally of the following types :

(i) " **Carbons** " obtained by the firing, at a temperature (1000 to 1200 ºC) insufficient to produce true " graphitisation ", of mixtures of finely ground coke or lamp black and powdered natural or artificial graphite with carbonaceous binders such as pitches or tars.

The structure of the products thus obtained is not homogeneous; microscopic examination shows a mixture of grains of graphite with grains of amorphous carbon and, on chemical analysis, the graphitic acid precipitate is weaker than that obtained from artificial graphite.

(ii) **Metallo-graphitic grade compositions** obtained, by a process akin to sintering (agglomeration, moulding and firing), from mixtures of powdered graphite with powders of base metals (copper, cadmium or their alloys). Their metal content ranges from 10 to 95 %.

(iii) Grades obtained by moulding natural or artificial **graphite powder mixed with plastics**.

The blocks and plates, in particular, as obtained from the materials described above are generally in sizes about 200 x 100 x 35 mm or 150 x 70 x 30 mm. They are mainly used, after cutting and high-finishing machining (fine tolerances and appropriate surface finish) to make the electrical brushes of heading 85.45.

The above-mentioned semi-manufactures, when they contain powdered silver, are classified in **heading 71.06**. The heading also **excludes** blocks which have been cut to special shapes, surface-worked, surface finished, etc. (generally **heading 68.15** or **85.45**) and refractory goods, fired as ceramics, based on amorphous carbon or natural graphite (**heading 69.02** or **69.03**).

(b) **Carbonaceous pastes for electrodes**. These products consist mainly of a mixture of anthracite and coal tar pitch (which acts as a binder). They are usually put up in the form of small blocks, which are inserted in the upper part of a metal container, where they soften when exposed to heat. They are thus moulded inside the container to form an endless electrode for use in the furnaces, which no longer needs to be stopped to change worn-out pre-fabricated electrodes. The best known composition of this kind is " Soderberg paste ".

Similar pastes are used to make furnace linings which then harden *in situ*.

This category also covers **graphite in paste form**, consisting of a mixture of graphite in the form of particles (mostly exceeding 5 micrometres (microns)) with mineral oils, and equally suitable for use for treating the surfaces of heavy machinery or for the manufacture of graphited greases.