SLAG VON A–Z

A AGGREGATES

Granular material for use in the construction industry. Aggregates can be natural, industrially manufactured or recycled.

AIR-COOLED BLAST FURNACE SLAG

During slow cooling of the blast furnace slag in slag beds, the crystalline air-cooled blast furnace slag is created.
In addition to being used as a construction material, air-cooled blast furnace slag can also be processed to make blast furnace lime, a fertiliser.

ASH

Ash is the solid residue from combustion processes. Industrial combustion processes mostly aim to extract energy from coal, oil or even domestic waste (see domestic waste incineration ash). The primary aim is therefore not to obtain valuable materials, as it is in metallurgical processes, where the focus is on obtaining a metal.

B BLAST FURNACE

The blast furnace is a continuously operated shaft furnace. In the blast furnace, the iron oxide contained in ore, sinter and pellets is reduced and melted to form liquid pig iron. As a by-product, this process generates blast furnace slag.

BLAST FURNACE CEMENT

The main constituents of blast furnace cement are Portland cement clinker and ground granulated blast furnace slag. It is defined in the European cement standard EN 197-1. According to this standard, it contains 36–65% by weight (CEM III/A), 66–80% by weight (CEM III/B) or 81–95% by weight (CEM III/C) ground granulated blast furnace slag. The first German standard for blast furnace cement was published in 1917 already.

BLAST FURNACE SLAG

Blast furnace slag is produced as molten rock during the manufacturing of pig iron from ore and mineral additives in the blast furnace. Together with steel slag and non-ferrous slag, these are described in DIN 4301 “Ferrous slag and non-ferrous slag in the construction industry”.
Blast furnace slag is a collective term for air-cooled blast furnace slag and ground granulated blast furnace slag.

BLAST FURNACE LIME

Lime fertiliser, produced by grinding blast furnace slag

BOF SLAG

BOF slag is steel slag, and is defined according to DIN 4301 as the ferrous slag generated during in a during the production of crude steel using the Linz-Donawitz method (basic oxygen furnace, converter steel process). It is produced in the form of molten rock during the processing of pig iron and pre-treated steel scrap in the converter steel process. The abbreviation BOF stands for the basic oxygen furnace in which this process takes place.

The molten BOF slag is poured into slag pits at approx 1,600°C, and slowly solidifies there as crystalline mineral material. After cooling, the slag is processed by means of crushing and screening in processing plants to produce crushed aggregates, grit, crushed sand, high-grade grit, high-grade crushed sand, and mineral material mixtures.

C CEMENT

Cement is a hydraulic binding agent, i.e. upon contact with water, it immediately produces strength-forming reaction products that are durable, both above water or underwater. Cement is used for manufacturing concrete, mortar and other construction products. There are many different types of cement, which differ in terms of their composition, fineness and technical suitability for different applications. EN 197-1 for "standard cements" alone currently describes 27 different cement types and 9 different strength categories.

CONCRETE

Concrete is a mixture of cement, aggregates, water, and possibly concrete additives (e.g. finely ground granulated blast furnace slag, mineral coal fly ash) and chemical concrete additive agents. Initially soft and malleable, concrete hardens after curing above water or underwater, and can achieve extremely high strengths. Because of its flexible technical properties, its relatively low price, and the availability virtually anywhere on Earth of aggregates and water, concrete is the most commonly used construction material. In Europe, the requirements for concrete are defined in EN 206.

CONVERTER LIME

Lime fertiliser, produced by grinding converter slag or screening disintegrated converter slag. (Fertilisers and lime fertilisers must fulfil the minimum effectiveness requirements, and comply with the limit values for harmful substances, as defined in the German Fertiliser Ordinance.)

CONVERTER SLAG

See BOF slag

D DOMESTIC WASTE INCINERATION ASH

Domestic waste incineration ash is produced from crude domestic waste incineration ash by means of treatment (separation conveyor, drum magnet, overbelt magnet and screening system). Crude domestic waste incineration ash is produced during the incineration of residential waste, domestic waste, and commercial waste similar to domestic waste, in the combustion chambers of domestic waste incineration plants. The domestic waste incineration ash is not permitted to contain boiler dust, filter dust or reaction products from the flue gas scrubbing system.

E ELECTRIC ARC FURNACE SLAG

Electric arc furnace slag from the production of quality steel is steel slag, and is defined according to DIN 4301 as the ferrous slag generated during the production of crude steel. It is produced in the form of molten rock during the processing of pre-treated steel scrap, pig iron and sponge iron to make steel in the electric arc process (electric furnace process).

The molten EAFS is poured into slag pits at approx 1,600°C, and slowly solidifies there as crystalline mineral material. After cooling, the slag is processed by means of crushing and screening in processing plants to produce crushed aggregates, grit, crushed sand, high-grade grit, high-grade crushed sand, and mineral material mixtures.

F FERROUS SLAG

Slag that is produced during the manufacture of iron and steel. Collective term for blast furnace slag and steel slag

FINELY GROUND GRANULATED BLAST FURNACE SLAG

Finely ground granulated blast furnace slag is ground granulated blast furnace slag that has been ground to the fineness of cement. It is either a component of cement (blast furnace cement, Portland slag cement) or is used directly as a concrete additive. The material requirements for finely ground granulated blast furnace slag as a concrete additive are defined in EN 15167-1.

FLY ASH

Fly ash is produced during the combustion of coal in power plants. Depending on the fuel used, a distinction is made between e.g. mineral coal fly ash and lignite fly ash. Depending on the chemical and mineralogical composition, fly ash may produce a pozzolanic reaction, i.e. in combination with a reaction partner, it may produce strength-forming and durable reaction products through contact with water.

Mineral coal fly ash in particular is used as a concrete additive or as a component of cement. The material requirements for mineral coal fly ash as a concrete additive are defined in EN 450-1.

G GROUND GRANULATED BLAST FURNACE SLAG

If a large excess of water is used in granulation plants to convert the molten blast furnace slag into a grainy granulate < 5 mm, ground granulated blast furnace slag is produced. Because of its chemical composition and its extensively glassy grain structure, it has latent hydraulic properties.

This means that when the granulated blast furnace slag is ground to the fineness of cement, appropriate chemical activation and contact with water can produce strength-forming and durable reaction products. This property was discovered in 1861 already, and ground granulated blast furnace slag has thus been used since the end of the 19th century for manufacturing cement, concrete, and mortar, etc. In an unground form, it can be used as aggregates for various construction purposes.

N NON-FERROUS SLAG

Collective designation for slag that is produced in the form of molten rock during the manufacturing of lead, ferrochrome, copper, nickel and waelz oxide. Non-ferrous slag can solidify in a glassy or crystalline form.

P PORTLAND CEMENT

The main component of Portland cement is Portland cement clinker. It is defined in the European cement standard EN 197-1. Portland cement clinker is produced in a sintering process at around 1,450°C, predominantly from primary raw materials containing limestone and clay. Ground to cement fineness, it reacts hydraulically, i.e. upon contact with water, it immediately produces strength-forming reaction products that are durable, both above water or underwater. The first German standard for Portland cement was published in 1877.

PORTLAND SLAG CEMENT

The main constituents of Portland slag cement are Portland cement clinker and ground granulated blast furnace slag. It is defined in the European cement standard EN 197-1. According to this standard, it contains 6–20% by weight (CEM II/A-S) or 21–35% by weight (CEM II/B-S) ground granulated blast furnace slag. The first German standard for Portland slag cement (known at the time as iron Portland cement) was published in 1909 already.

S SECONDARY METALLURGICAL SLAG

Secondary metallurgical slag (SECS) refers to those slags from iron and steelmaking that are formed during the subsequent treatment of the liquid pig iron and crude steel. In the following, only slag from the retreatment of crude steel will be discussed, which is produced during the manufacturing of quality and bulk steel. Fulfilling today's quality requirements for steel makes it necessary to perform in separate secondary metallurgical procedures certain process steps that used to be performed in the melting chamber (converter, electric arc furnace) or in the steel ladle. Through the use of lime and other slag formers, the slag is formed predominantly from lime, silicic acid and alumina. The SECS is poured into slag pits at approx 1,600°C, and slowly solidifies there as crystalline mineral material. Because of chemical reactions and mineral transformations during cooling, SECS is present not only in chunks, but also in fine-grained form.

SLAG AS SECONDARY RAW MATERIAL

"Slag" is a metallurgical term. Etymologically, it is derived from the Low German word "slagge" (meaning "to beat"), and comes from the medieval metal production process in the bloomery iron-smelting furnace, which produced a doughy lump of metal and slag, and which had to be beaten with wooden mallets to separate the metal and slag from one another. Today, slag is formed during the production of metals (iron, steel, copper, etc.) in a smelting process, predominantly being formed from the non-metallic components of the ores and mineral additives that are added to lower the melting point of the ore. The slag performs metallurgical tasks, e.g. absorbing trace elements that are not wanted in the metal. Because the ratio of slag to metal can be very high during metal production (in blast furnace slag today, around 270 kg per tonne of pig iron, but in the 19th century around 1,000 kg per tonne of pig iron), its use has been of great economic and ecological importance for decades.

SLAG METALLURGY

Slag metallurgy is concerned with all aspects of producing, treating, curing, treating and recycling ferrous and non-ferrous slags. This includes measures in both the liquid and hardened state. The overall aim of these measures is to improve the physical and environmental properties of the slag, but also its thermal content.

STEEL SLAG

Molten rock that is produced during the manufacturing of steel. It is named after the respective steelmaking process (e.g. BOF slag, electric arc furnace slag, or secondary metallurgical slag from the retreatment of crude steel).

STAINLESS STEEL SLAG

Slag that is produced during the manufacture of high-alloyed steel ("stainless steel")

V VOLUME STABILITY

Volume stability means that environmental influences (in particular moisture) do not change the volume of a solid object (e.g. a piece of rock). Blast furnace slag and steel slag may respond differently here:

- blast furnace slag is volume-stable.
- by contrast, under unfavourable conditions, steel slag may contain components that are not volume-stable. Test procedures are now available for evaluating volume stability, allowing unsuitable slags to be excluded from use. The tests are performed regularly, both by the manufacturer in internal quality control processes and in the course of third-party monitoring by independent external testing bodies.