

Method for incinerating carbon-containing dry metallic ash

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The invention relates to a method for incinerating carbon-containing dry metallic ash and a device for implementing said method.

Metallic ash is understood to be the product of primary incineration of recycling material that contains plastic materials and solvents and is to be reprocessed for its noble metal content.

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Noble metals can be present in recycling material of this type either in elemental or chemically bound form, e.g. as salts or oxides. The metallic ash can therefore also contain these substances.

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Following primary incineration/carbonisation, said ashes still contain substantial fractions of carbon that should be removed before further recycling steps and/or should be reduced to a fraction of less than 3 %.

US4360380/DE3134733A1 specifies a metal recycling method, in which the incineration of organic fractions is carried out at temperatures below the slag formation temperature of the silicate fractions. This is aimed at preventing valuable metals from being included in glass:

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"The slag formation temperature of quartz is approx. 760°C. Accordingly, if the incineration proceeds at a temperature between 315 and 480°C and in the presence of sufficient oxygen or of an excess of oxygen with adequate stirring, it has been found that the organic fraction is incinerated without undesirable silicates being formed."

Accordingly, DE3134733A1 describes a method having the following features:

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"Method for recycling selected metal fractions from quartz-containing sludges by incinerating the sludge in order to disintegrate organic fractions followed by acidic leaching of the ash and hydrometallurgical recovery of the metal fractions from the remaining solid and liquid residues, whereby the incineration is carried out at a temperature below the slag formation temperature of silicates in order to prevent metal fractions from being occluded in glass matrices that are not attacked by the subsequent acidic leaching and the hydrometallurgical procedural steps."

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According to DE3134733A1, the process is carried out in a furnace. The efficiency of the process is said to be increased through stirring and supplying air: *"Moreover, it has been evident that stirring of the sludge aimed at keeping the temperature at an even level throughout*

and increasing the access of oxygen to the organic material, improved the method significantly. Obviously, stirring or forced aeration are used in one way or another in many sludge incineration facilities and are not considered to be novel features as such".

In contrast, the present invention provides a method for incinerating carbon-containing slags in open troughs through overturning on air and includes additional aeration from below, as described in claim 1. Consistent with DE3134733A1, the prior art is the incineration in open troughs with frequent overturning by means of rakes. Additional aeration from below according to the invention surprisingly reduces the duration of the incineration process by 50 to 80%. This is more than an additive effect and rather represents a surprising synergism. Additional aeration from below according to the invention surprisingly reduces the duration of the incineration process by 50 to 80%. This is more than an additive effect and rather represents a surprising synergism. It also needs to be noted that the material burns more rapidly after ignition. The overturning by means of rakes is kept for expedient reasons to ensure that no crusts are formed at the hearth region of the troughs or on the surface of the incinerated goods. The carbon content is reduced to less than 3%.

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Another option is to enrich the air, which is blown-in from below, with oxygen in order to improve the efficiency of incineration.

According to an essential feature of the method according to the invention, any reverse transport of ash is prevented whereas the supply of air and/or oxygen is maintained.

In detail, the method comprises the steps of:

- a) adding metallic ash into a trough;
 - b) aerating from above with ambient air;
 - c) injecting air and/or oxygen through the trough hearth;
 - d) establishing the ignition temperature;
 - e) stirring of the metallic ash by means of a suitable tool;
 - f) whereby the carbon content is reduced to less than 3%;
- whereby steps b), c), and d) can proceed concurrently or in alternating order or pairs or all of these steps can proceed concurrently;
- step d) can just as well proceed selectively in partial quantities of the metallic ash;

and the reverse transport of ash through the trough hearth is prevented, whereas the supply of air and/or oxygen is maintained.

5 In a convenient embodiment, the incineration process is carried out in a multiple hearth incinerator at the open top of the trough exposed to ambient air and by means of injecting air from below. The time for the carbon fraction to reach a level below 3% is 2 hours.

10 The invention also relates to a device for implementing a method, according to claim 2, of the type described above in the form of a container, preferably a trough, that comprises a hearth that is aerated from below.

The hearth comprises means preventing the ash from dropping through the grate, whereas the supply of air and/or oxygen from below is not obstructed.

15 Preferably, the invention provides a hollow double-hearth trough having an upper hearth and a lower hearth. Openings, such as, e.g., holes or slits, in the upper and lower hearth ensure the supply of air from below, whereas metal fibres, such as a wire mesh or similar material, in the space between the hearths ensures that the ash cannot fully drop through the two hearths. In addition, it is expedient for the openings to be situated not directly across from each other, which results in favourable flow conditions from the start.

20 Overall, the feature of having a metal fibre-containing double-hearth trough provides a surprisingly simple solution allowing the desired substance transport from below to proceed while sufficiently impeding the undesired substance transport from above.

25 Flow guides are another expedient feature that further optimises the flow conditions provided they are situated properly.

The fibres can be present as woven material, fabric, non-woven fabric or knitted material. Preferably, they are knitted.

Fig. 1 shows a preferred embodiment of the device.

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This comprises

- a) a trough **a1**
- b) having a level hearth **b2**,
- c) whereby hearth **b2** comprises openings **c3**,

- d) with metal fibres **d4** being arranged below hearth **b2** and forming a space **d4a**, which is closed in downward direction through
- e) another trough hearth **e5** that is arranged parallel to hearth **b2**
- f) having further openings **f6** that are arranged at an offset from said openings **c3**, where-
5 by
- g) hearth **e5** and hearth **b2** are connected by means of connecting means **g7** in such manner that metal fibres **d4** are firmly occluded, and
- h) a space **h8** is provided below hearth **e5** to which
- i) means **i9** for supplying air or/and oxygen are provided.

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Flow guides for optimising the air circulation can be provided in space (h8).

The metal fibres (d4) can be present as woven material, fabric, fleece or knitted material.

Preferably, they are knitted.

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CLAIMS

1. Method for incinerating carbon-containing dry metallic ash, the method comprising the steps of:

- a) adding the metallic ash into a metal fiber-containing double-hearth trough;
 - b) aerating from above with ambient air;
 - c) injecting air and/or oxygen through the metal fiber-containing double-hearth of the trough;
 - d) establishing the ignition temperature;
 - e) stirring the metallic ash by means of a suitable tool;
 - f) wherein the carbon content is reduced to less than 3%; and
- wherein steps b), c), and d) can proceed concurrently or in alternating order or pairs or all of these steps can proceed concurrently; and
- steps b) and c) proceed concurrently, at least for part of the time;
 - step d) can just as well proceed selectively in partial quantities of the metallic ash
- wherein the reverse transport of ash through the trough hearth is prevented, whereas the supply of air and/or oxygen is maintained.

2. Device for implementing a method according to claim 1, comprising

- a) a trough,
- b) having a first level hearth,
- c) wherein the first hearth comprises openings,
- d) with metal fibres being arranged below the first hearth and forming a space, which is closed in downward direction through
- e) a second trough hearth that is arranged parallel to first hearth
- f) having further openings that are arranged at an offset from said openings of the first hearth, wherein
- g) the second hearth and the first hearth are connected by connecting means in such a manner that the metal fibres are firmly occluded, and
- h) a further space is provided below the second hearth to which
- i) means for supplying air or/and oxygen are provided.

3. Device according to claim 2, wherein
 - j) flow guides for optimising air circulation are provided in the further space.
4. Device according to claim 2 or 3, wherein
 - k) the metal fibres are present as woven material, fabric, fleece or knitted material.