Claims

1. Process for reprocessing waste materials containing valuable metals in a fluidized-bed furnace (100), comprising the phases:

I. Start-up of the fluidized-bed furnace (100); and

II. Continuous reprocessing of the waste materials,

characterized in that the fluidized-bed furnace (100) is operated autothermally during the phase II of continuous reprocessing of the waste materials containing valuable metals, with the process temperature being regulated by the fill level of the fluidized-bed furnace (100) and the flow rate of material through the furnace, wherein the fluidized-bed comprises

- a steel vessel (108) having a refractory lining (118),
- an inlet (101) for waste materials containing valuable metals,
- at least one outlet for discharge of material (110, 111),
- at least one inlet for introduction of process air (102)
- a preheating device for preheating the process air, and
- a fill level measuring device, preferably based on a differential pressure measurement between two measurement points (112, 113), of which one measurement point (113) is arranged above the bed of material and one measurement point (112) is arranged below the bed of material,
- at least one pressure meter (119) for measuring the pressure in the interior of the steel vessel (108), and

a control device which is configured to control the level measuring device in such a way that, by means of the differential pressure measurement with the pressure sensors (112, 113) and considering the process temperatures of 630°C to 730°C in the continuous phase II, the level of the steel vessel (108) is kept in the range from 15% to 25%, wherein

- the material is discharged by gravity by activating the flap in the at least one outlet (110, 111);

- and/or the process temperature is kept in the range from 630°C to 730°C, the process air being preheated to a temperature in the range from 45°C to 130°C by means of the preheating device;

- and/or the pressure in the interior of the steel container (108) is kept in the range between -0.2 and -0.3 mBar by controlling an exhaust gas extraction device.

2. Process according to Claim 1, characterized in that the fluidized-bed furnace (100) is operated at a flow rate of material through the furnace of about 1000 kg/h during the continuous, autothermal phase II.

3. Process according to any of the preceding claims, characterized in that from 3000 to 5000 kg/h of process air, which is preferably preheated to a temperature in the range from 45°C to 130°C, are introduced into the fluidized-bed furnace (100) during the continuous, autothermal phase II.

4. Process according to any of the preceding claims, characterized in that the residence time of the waste materials containing valuable metals in the fluidized-bed furnace (100) during the continuous, autothermal phase II is about 4 hours.

5. Process according to any of the preceding claims, characterized in that the fluidized-bed furnace (100) is operated under reduced pressure, preferably at a pressure in the range from -0.2 to -0.3 mbar, during the continuous, autothermal phase II.

6. Process according to any of the preceding claims, wherein the phase I of start-up of the fluidized-bed furnace (100) comprises the steps:

i) Introduction of previously reprocessed material into the fluidized-bed furnace while simultaneously blowing process air into the fluidized-bed furnace and fluidization of the material,
ii) Heating of the fluidized-bed furnace to the process temperature using at least one, preferably two, particularly preferably three, gas burner(s),
iii) Introduction of waste materials containing valuable metals,
iv) Ignition of the reaction using an ignition burner,
v) Switching-off of all burners when the process temperature of from 630°C to 730°C has been reached.

7. Process according to any of the preceding claims, wherein the ignition burner (109) is taken from the process after completion of the phase I of start-up of the fluidized-bed furnace (100).

8. Apparatus comprising a fluidized-bed furnace (100) for recycling waste materials containing valuable metals in a continuous autothermal process, wherein the fluidized-bed furnace (100) comprises

- a steel vessel (108) having a refractory lining (118),
- an inlet (101) for waste materials containing valuable metals,
- at least one outlet for discharge of material (110, 111), wherein the at least one outlet (110, 111) for the material discharge of the fluidized bed furnace (100) has a flap for controlling the material discharge rate;
- at least one inlet for introduction of process air (102) and
- a preheating device for preheating the process air to 45°C – 130°C,
- at least one gas burner, preferably two gas burners, particularly preferably three gas burners (106A, 106B, 106C) which are operated only for heating the fluidized-bed furnace (100) to a process temperature of from 720°C to 730°C during start-up,
- a fill level measuring device, preferably based on a differential pressure measurement between two measurement points (112, 113), of which one measurement point (113) is arranged above the bed of material and one measurement point (112) is arranged below the bed of material,
- at least one pressure meter (119) for measuring the pressure in the interior of the steel vessel (108),

at least one temperature sensor, preferably a plurality of temperature sensors, particularly preferably six temperature sensors (114, 115, 116), for measuring the process temperature, of which at least two temperature sensors (selected from among 114, 115 and 116) are arranged vertically distributed over the bed of material, and a control device which is configured to

- control the level measuring device in such a way that, by means of the differential pressure measurement with the pressure sensors (112, 113) and considering the process temperatures of 630°C to 730°C in the continuous phase II, the level of the steel vessel (108) is kept in the range from 15% to 25%, wherein he material is discharged by gravity by activating the flap in the at least one outlet (110, 111);

- and/or the process temperature is kept in the range from 630°C to 730°C, the process air being preheated to a temperature in the range from 45°C to 130°C by means of the preheating device;

- and/or the pressure in the interior of the steel container (108) is kept in the range between -0.2 and -0.3 mBar by controlling an exhaust gas extraction device.

9. Apparatus according to claim 8 , characterized in that the fluidized-bed furnace (100) further comprises an air distributor (104) with air nozzles (105) for distributing the process air which is fed via the at least one inlet (102) into the fluidized-bed furnace (100), with the air distributor (104) preferably being arranged in the lower region of the fluidized-bed furnace (100).

10. Apparatus according to any of Claims 8 and 9, characterized in that the fluidized-bed furnace (100) further comprises an ignition burner (109) for one-off ignition/starting of the continuous, autothermal process phase II for recycling waste materials containing valuable metals, with the ignition burner (109) preferably being taken from the process after ignition.

11. Apparatus according to any of Claims 8 to 10, further comprising one or more auxiliary and additional devices selected from among

- a differential metering balance in the material feed region, which is preferably coupled with the fill level measuring device and the temperature measurement of the process temperature,
- a means for transporting the discharged treated material further, for example comprising a cooling transport screw, a pneumatic transport device and a packaging device for Big Bags,
- optionally a rotary tube furnace for calcining and/or further processing the discharged treated material,
- an exhaust gas purification system, for example comprising
    - at least one fine filter for separating off dust-like material and discharging it into the product stream,
    - a plurality of scrubbing stages for desulfurizing the exhaust gas stream, for example a scrubbing stage using water and two scrubbing stages using milk of lime,
    - optionally an additional stage for scrubbing the exhaust gas stream with dilute sodium hydroxide solution,
- one or more explosion flaps in the exhaust gas system to protect against overpressure, and
- a heat exchanger for cooling the exhaust air in the exhaust gas stream and for simultaneously preheating the process air to from 45 to 130°C.