Method for reducing molten raw materials, and device for carrying out said method

Summary

In one aspect, there is provided method for reducing molten raw materials, in which the raw materials in a solid or molten state are placed on a bed comprising coke pieces, which bed is inductively heated at least partially, and the reduced melt that runs off the coke bed is collected and the waste gases are discharged, characterised in that a coke bed is used that is delimited internally by a pipe-shaped element, with the pipe-shaped element being heated and the reaction gases from the coke bed being discharged via a plurality of exhaust vents formed in the pipe-shaped element. In another aspect, there is provided device for reducing molten raw materials, in particular for performing a method according to the present invention, comprising a reactor for receiving a bed of coke pieces and an induction heater comprising at least one induction coil for the induction heating of the coke bed, with the reactor having a feed opening for the solid and molten raw materials and a tap hole for the processed melt, characterised in that the reactor is designed to receive a coke bed with a ring-shaped cross section that is delimited internally by a pipe-shaped reactor element, with the pipe-shaped element being made of a material suitable for inductive coupling with the induction field of the induction coil, in particular graphite, and having a plurality of exhaust vents for discharging the reaction gases from the coke bed.

Description

The invention relates to a method for reducing molten raw materials, in which the raw materials in a solid, molten or gaseous state are placed on a bed comprising coke pieces, which bed is inductively heated at least partially, and the reduced melt that runs off the coke bed is collected and the waste gases are discharged. The invention also relates to a device for carrying out this method, comprising a reactor for receiving a bed of coke pieces, and an induction heater comprising at least one induction coil for the induction heating of the coke bed.

The molten raw materials to be reduced are in particular ores, dusts, slags, residues from pyrolysis, gasification and combustion, melts, slurries, ESU (Elektro-Schlacken-Umschmelz [electrical slag remelt]) slag components (such as, e.g. CaO, CaF_2, Al_2O_3) and/or metal oxide glasses as well as mineral melts to be degassed.

Coke pieces in the context of this invention include in particular carbon carriers such as coke, anthracite and graphite. According to the invention said carbon carriers are advantageously mixed

with highly-reactive carbon carriers such as black coal, lignite or charcoal, biomass, unloaded or loaded activated charcoal.

Dust and slag, in particular waste slag, shredder lightweight fractions, composite materials such as, for example, coated aluminium foil, steel slag as well as slag from non-ferrous metallurgy and inorganic technology contain a number of metallic oxides, in the case of steel slag the latter contains considerable amounts of heavy metal oxides.

It has already been proposed to apply liquid melts onto an appropriately reducing metal bath, in particular a ferrous bath containing dissolved carbon as the reducing agent to reduce such undesired metal oxides, in particular oxides of chromium, vanadium, molybdenum, tungsten, cobalt, manganese, lead, copper and zinc, with the reduced metals transforming into metal regulus or a gaseous phase.

However, it is for the most part necessary to use the original materials directly as melts in order to utilize the heat of the melt, if such a method is to be conducted efficiently.