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PROCESS FOR PURIFYING SOOT

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The present invention relates to a process for purifying soot being contaminated by metallic constituents and more particularly it relates to a process for treating metal-containing soot by means of carbon monoxide after a pretreatment with another gas.

According to the present invention soot containing metallic constituents as, for instance, metal carbide is subjected to a preliminary treatment in a reducing, inert or weakly oxidizing gas atmosphere at a temperature of between about 150–600° C. The reactivity of the metallic compounds towards carbon monoxide is considerably increased by treating the soot at a temperature of about 400–500° C. in a reducing atmosphere of hydrogen or in a current of inert gas. The reactivity is likewise enhanced by passing over the mixture a weakly oxidizing current of gas containing between about 1–10%, for example, 4% of oxygen at a temperature of 200–400° C. After this pretreatment the soot is subjected to a treatment with carbon monoxide or gases containing the same at a temperature of between about 50–210° C. The carbon monoxide combines with the metal forming thereby metal carbonyl, which is drawn off by the current of carbon monoxide. By decomposing the carbonyl the respective metal can, of course, be readily recovered. In most cases it is advantageous to effect the treatment at elevated pressures, say at about 2–150 atmospheres pressure.

The invention is illustrated by the following examples, without being limited thereto:

Example 1.—10 kgs. of a mixture of soot and nickel carbide, containing 90 grams of nickel are heated for two hours at 430° C. in a current of nitrogen. Carbon monoxide is then passed over at 90° C. and 6 atmospheres pressure, whereupon the whole of the nickel is removed as carbonyl, which, by heating (to 200° C.) is split up into metallic nickel and carbon monoxide.

Example 2.—8 kgs. of a mixture of soot and nickel carbide, containing 80 grams of nickel are heated for two hours at 320° C. in a current of nitrogen containing 4% of oxygen. Carbon monoxide is then passed over at 90° C. and 5 atmospheres pressure until the nickel is completely removed in the form of carbonyl.

The heating of the pretreated soot may advantageously be accomplished with the addition of small amounts of sulphur although the addition of sulphur is not absolutely essential to the reaction between the metal and the carbon monoxide. The amount of sulphur to be added may vary, but it is preferable to employ about 1 gram of sulphur to about 10 kgs. of soot when the removal of the metal is accomplished at temperatures between about 50–210° C. and when employing pressures of about 2–150 atmospheres.

The mixture of soot and metal or soot and metallic carbides which are treated according to the process of the present invention are obtained in the preparation of carbon by splitting carbon monoxide by means of metals of the VIIIth group of the periodic system.

As an example, a soot mixture can be employed which is obtained in the following manner:—

Carbon monoxide is passed over 90 grams of nickel powder obtained by reduction of nickel oxide at a temperature of 350–400° C. The reaction is interrupted when 900 grams of carbon have been deposited and this mixture of soot and metal, or soot and nickel carbide, is treated as indicated above.

We claim:

1. Process for removing metal carbides from soot containing the same comprising heating the soot in an atmosphere free from carbon monoxide to a temperature of about 150–600° C., and heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents.

2. Process for removing metal carbides from soot containing the same comprising heating the soot in an atmosphere free from carbon monoxide to a temperature of about 150–600° C., heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents, and effecting both treatments at a pressure of between about 2–150 atmospheres.

3. Process for removing metal carbides from soot containing the same comprising heating the soot with hydrogen to a temperature of about 300–500° C., and heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents.

4. Process for removing metal carbides from soot containing the same comprising heating the soot with hydrogen to a temperature of about 300–500° C. and heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents, and effecting both treatments at a pressure of between about 2–150 atmospheres.

5. Process for removing metal carbides from soot containing the same comprising heating the soot in an atmosphere free from carbon monoxide to a temperature of about 150–600° C. adding about 1 gram of sulfur to about 10 kgs. of soot, and heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents.

6. Process for removing metal carbides from soot containing the same comprising heating the soot in an atmosphere free from carbon monoxide to a temperature of about 150–600° C. adding about 1 gram of sulfur to about 10 kgs. of soot, heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents, and effecting both treatments at a pressure of between about 2–150 atmospheres.

7. Process for removing metal carbides from soot containing the same comprising heating the soot with a reducing gas to a temperature of about 300–500° C. adding about 1 gram of sulfur to about 10 kgs. of soot, and heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents.

8. Process for removing metal carbides from soot containing the same comprising heating the soot with hydrogen to a temperature of about 300–500° C. adding about 1 gram of sulfur to about 10 kgs. of soot, and heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents.

9. Process for removing metal carbides from soot containing the same comprising heating the soot with a reducing gas to a temperature of about 300–500° C. adding about 1 gram of sulfur to about 10 kgs. of soot, heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents, and effecting both treatments at a pressure of between about 2–150 atmospheres.

10. Process for removing metal carbides from soot containing the same comprising heating the soot with hydrogen to a temperature of about 300–500° C. adding about 1 gram of sulfur to about 10 kgs. of soot, heating the soot thereafter with a current of a gas containing carbon monoxide at a temperature of between about 50–210° C. until the soot is completely purified from metallic constituents, and effecting both treatments at a pressure of between about 2–150 atmospheres.

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