

UNITED STATES PATENT OFFICE

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PROCESS FOR THE MANUFACTURE OF A
NOVEL BINDING AGENT FOR CORE SAND
FROM SULFITE LYEFranz Rudolf Moser, Hausen, near Brugg, Switzer-
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8 Claims. (Cl. 22-188)

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The binding agent used in the foundry for the manufacture of sand cores should produce cores of proper strength, it should generate a minimum of gas when the cores come in contact with the molten metal, it should give cores with a maximum of porosity and it should show good collapsibility after pouring. With the binding agents hitherto known, as for example linseed oil or other drying oils, bituminous substances, rosins and rosin oils, starch and its derivatives, glue, artificial resins or sulfite lye the above mentioned conditions can only be obtained in an unsatisfactory manner. Especially the sulfite-lye has the disadvantage of giving to the cores only an insufficient resistance against mechanical stresses which moreover is rapidly reduced when cores are stored and when dry sand cores are used in green sand molds.

It has now been found that a binding agent for founders core sand with novel properties can be produced from sulfite lye, when the latter is mixed with an ammonium salt of a mineral acid in an amount sufficient to bring about carbonization of the sulfite lye at the elevated temperatures usually applied in baking sand cores. This addition causes during the baking process, which usually is performed at temperatures of about 150°-250° C., the sulfite lye to become a hard, more or less carbonised mass, which gives to the cores the desired properties in a high degree. As starting material one may use the lye which is obtained as a by-product in the manufacture of cellulose from wood by the sulfite process, which if desired may have been used previously in the process for the production of alcohol and which contains besides water, inorganic substances and carbohydrates, chiefly salts of lignin sulfonic acids. A concentrated lye containing up to 50% of water or a dried powdered lye are preferably used in the present process. It is advisable to use a lye which is obtained by direct evaporation without preceding precipitation of the salts of calcium and iron.

The ammonium salts of the mineral acids used in the present process are preferably those of sulphuric acid or phosphoric acid. Ammonium salts of acids which are readily evaporated such as hydrochloric acid or readily reduced such as nitric acid are not so favorable. At the higher temperatures used for the baking of the cores these ammonium salts form free acid by dissociation, which then brings about the carbonization of the sulfite lye.

The amount of addition of said ammonium salts depends on the composition of the sulphite

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lye, on the desired mechanical properties of the cores to be obtained and on the quality of the core-sand used. It is advisable that in the case of concentrated lye preferably used in a form containing calcium salts, the addition is in excess of the equivalent of the lime present. Generally an increased addition of ammonium salts will give cores with a higher compression and bending strength. When using a sand containing basic components as sand containing clay it may be advisable to use higher additions than in the case of pure quartz sand.

The binding agent according to the present invention is especially adapted to be used with impure founders core sand, for example sand containing clay.

In order to prevent the corrosive effect against metals, which might occur with the binding agent according to this invention, substances known as corrosion inhibitors may further be added.

When starting from liquid sulfite lye it may be desirable to raise the viscosity of the core binding agent to be produced, this may be effected advantageously by a prolonged heating. On the other hand the viscosity of the product may be lowered by diluting with water or watery solutions.

The core sand binding agent according to the invention may be used alone or together with other known binding agents.

With the new binding agent, cores may be produced which are sufficiently resistant to handling in unburnt state due to the fact that they harden even when stored at room temperature. The binding agent may also be used in such a way that the mixture of sand and binder produced in usual manner is fairly dried by storing it under free access of air and then using this dried product as addition to a freshly prepared mixture. This method gives cores with a good green strength and saves the use of additions for green strength.

The binding agent according to the present invention, gives generally the best results when the cores are baked during about one hour at temperatures of about 240° C. Lower baking temperatures of about 220°-200° C. require a longer baking of about 2 to 4 hours. When it is desired to bake the cores over night the temperature is advantageously lowered to about 180° C.

Example I

100 parts by weight of a concentrated lime and iron containing sulfite lye with a water

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content of about 50% as may be obtained by direct evaporation of waste sulfite lye liquor containing about 4% of calcium calculated as CaO are mixed with 14 parts by weight of ammonium sulfate, while stirring. The mixture is stirred and blown with air at a temperature of 70° C. for such a time that the product has a flow out time of 25 to 30 seconds in the Ford-beaker No. 8. After cooling 1 kg. of hexamethylene tetramine is dissolved in this product as corrosion inhibitor, while stirring.

The core sand binding agent obtained in this manner is a storable oily fluid.

Example II

100 parts by weight of solid pulverized sulfite waste lye with a content of calcium compounds corresponding to 8% CaO are mixed intimately with 20 parts by weight of ammonium sulfate. One obtains a dry binding material which may either be used alone or together with other binding agents and which gives, after addition of water, a good binding effect. By variation of the amount of water the cohesion resistance of the green strength of the cores manufactured with this binding material may be influenced within wide ranges. It is also possible to use moist sand.

The products of the examples are excellent binding agents for founders core sand and give when used in a quantity of 5 to 6% by weight cores with a high compression and bending strength, a high grade of porosity, excellent collapsibility and only a very small formation of gases. As far as the mechanical properties of the cores obtained with the binder according to the present invention are concerned, it may be said, that the bending strength is increased at least tenfold compared with untreated sulfite lye. Furthermore the cores are not hygroscopic after drying compared with those obtained with untreated sulfite lye.

I claim:

1. A process of producing a binding agent for founders core sand from sulfite lye, comprising adding to the sulfite lye an ammonium salt of a mineral acid in an amount which upon dissociation is in excess of the amount necessary to neutralize the basic ingredients present in said lye and brings about carbonization of the sulfite lye at the elevated temperatures usually applied in baking sand cores.

2. A process of producing a binding agent for founders core sand from sulfite lye, comprising adding to the sulfite lye an ammonium salt of a polyvalent mineral acid in an amount which upon dissociation is in excess of the amount necessary to neutralize the basic ingredients present in said lye and brings about carbonization of the sulfite lye at the elevated temperatures usually applied in baking sand cores.

3. A process of producing a binding agent for founders core sand from sulfite lye, comprising adding to the sulfite lye ammonium sulfate in an amount which upon dissociation is more than equivalent to the basic constituents of the lye and which brings about carbonization of the sulfite lye at the elevated temperatures usually applied in baking sand cores.

4. A process for producing a binding agent for founders core sand from sulfite lye, comprising adding to commercial liquid sulfite lye an ammonium salt of a mineral acid in an amount which upon dissociation is more than equivalent

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to the basic constituents of the lye and which brings about carbonization of the sulfite lye at the elevated temperatures usually applied in baking sand cores, aerating the mixture and heating the same until a marked increase in viscosity has taken place.

5. A process of producing a binding agent for founders core sand from sulfite lye comprising mixing solid pulverized sulfite lye with an ammonium salt of a mineral acid in an amount which upon dissociation is in excess of the amount necessary to neutralize the basic ingredients present in said lye and brings about carbonization of the sulfite lye at the elevated temperatures usually applied in baking sand cores.

6. A process for producing founders sand cores comprising adding to sulfite waste liquor an ammonium salt of a polyvalent mineral acid in excess of the amount necessary to neutralize the basic ingredients of said liquor upon dissociation and which brings about carbonization of the sulfite lye during subsequent baking, mixing the resulting mixture with sand, forming a core and baking the core at a temperature of the order of 150° to 250° C.

7. A process for producing founders sand cores comprising adding to sulfite waste liquor an ammonium salt of a polyvalent mineral acid in excess of the amount necessary to neutralize the basic ingredients of said liquor upon dissociation and which brings about carbonization of the sulfite lye during subsequent baking, aerating the mixture and heating the same until a marked increase in viscosity has taken place, mixing the resulting mixture with sand, forming a core and baking the core at a temperature of the order of 150° to 250° C.

8. A process for producing founders sand cores comprising adding to sulfite waste liquor, ammonium sulfate in excess of the amount necessary to neutralize the basic ingredients of said liquor upon dissociation and which brings about carbonization of the sulfite lye during subsequent baking, mixing the resulting mixture with sand, forming a core and baking the core at a temperature of the order of 150° to 250° C.

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