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HIGH RESISTANCE MATERIAL

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3 Claims. (Cl. 201—75)

My invention relates to resistance materials having high values of electrical resistance and particularly to such materials derived by charring organic substances at controlled temperatures, and to a process of making the same.

It has been shown that organic substances may be blackened or charred by heat and still retain extremely high electrical resistance and insulating value. Charred material so formed may, because of this high resistance property, be utilized as an insulating pigment for electrical paints or varnishes requiring a high degree of electrical strength. Such a pigmented varnish is described and claimed in a copending application, Serial No. 704,366, filed December 28, 1933 by Mr. J. T. Goff and myself and assigned to the same assignee as this application.

In the application above referred to, charred wood pigments were formed by baking the wood at temperatures between 300° C. and 500° C. It has been found that when pigment is produced at higher temperature, the resistivity falls, the resistivity of a particular quantity so prepared depending upon the baking temperature used in preparing it. In the case of char formed from pine wood, the resistivity falls rapidly as the temperature is increased from 500° C. to 600° C. Other organic materials may also be used, the temperature at which the resistivity falls being different for different materials, for example, the resistivity of cotton after prolonged charring falls rapidly with an increase in temperature from 300° C. to 500° C.

In accordance with the present invention, it is proposed to utilize charred substances formed from organic materials as electrical resistors, or semi-conductors, having relatively high electrical resistivity, the desired value required being given to the material by baking it at the proper temperature during preparation of the material.

The resistivity retained by the charred material depends upon the maximum baking temperature and is practically independent of the length of time that the baking process is continued. I have heated pine wood for 10 days at a temperature of between 350° C. and 450° C. and found that the resistance remained too high to be measured by available instruments. Such chars have been extracted with alkaline solutions and various organic solvents without disintegrating the char or lowering its electrical resistance and given off only very small amounts of substance in solution.

The material being charred is contained in a nearly closed vessel practically excluding air, but permitting vapors to escape from the vessel. If air were permitted to enter the vessel, organic substances such as wood would ignite and burn to ash. Organic substances other than wood, such as asphalt, pitch, sugar, cotton and possibly bituminous coal might be used. I have found, however, that pine wood is a desirable material on account of its low ash content.

Chars produced in accordance with my invention may be molded into electrical resistors under pressure and employed for various uses. Stable and permanent electrical terminals or contacts for such resistors may be provided by molding low resistance conductors in intimate contact with the high resistance material.

One use of material, prepared in accordance with my invention, is as an aid in eliminating corona discharges about the surface of insulators. This may be done by preparing a wood char from pine wood baked at 600° C. for a prolonged time, the char being then ground and prepared as a putty for filling in the spaces about the tops of porcelain insulators. Another use for this material is as a paint to eliminate discharges about the ends of high voltage armature windings.

A satisfactory paint for this purpose may be made as follows: Pine wood is heated at from 350 to 450° C. in a partially closed vessel excluding air until smoke practically ceases. The char thus formed is ground into a fine powder in a pebble mill or other suitable apparatus. The powder is then baked in an electrical furnace, the temperature of which is automatically controlled for a particular temperature between 500° C. and 600° C. according to the resistivity required. The time of baking employed is about 18 hours. Paints consisting of wood char as above described have been prepared in which 100 grams of the char was mixed with 100 cubic centimeters of air drying oil varnish and 40 cubic centimeters of petroleum naptha. The particular binder used may be chosen according to the working characteristics of the paint required.

Paints prepared in the manner above described were applied to both sides of a three-quarter inch cotton tape in which the pigment was rubbed well into the fabric showed the following resistance per inch of tape according to the temperature of the baking process:

Baking temperature of the char	Resistance in megohms
515° C.	1500
550° C.	100
575° C.	1
600° C.	0.25

It will be observed that the temperature of the furnace during the baking process must be closely controlled in order to produce a material having a desired predetermined resistance value.

Such paints applied to coils and similar electrical apparatus by brushing prove very effective in eliminating corona therefrom at very high voltages. A limited amount of oil is used in ap-

plying such paints in order that the resistance of the paint will be the resistance of the material itself instead of the contact resistance of the particles included therein.

I have also used shellac varnishes as a surfacing and binding material for the pigment with very satisfactory results.

It will be understood that the description of particular embodiments of my invention is to be taken as illustrative of the principle and mode thereof and that modifications may be made within the spirit of the invention, without departing from the scope of the appended claims.

I claim as my invention:

1. The process of preparing material having a predetermined high value of electrical resistivity comprising heating pine wood at between 350° C. and 450° C. in an atmosphere substantially free from oxygen until smoking nearly ceases, grinding the resulting char and baking at a predetermined temperature between 500° C. and 600° C., according to the resistivity required, until the resistivity of the material reaches a constant value.

2. The process of preparing material having a predetermined value of electrical resistivity comprising heating pine wood in an atmosphere substantially free from oxygen, at a temperature sufficiently high to char it, until substantially free from volatile substances, grinding the resulting char and baking at a predetermined temperature above 500° C., according to the resistivity required, until the resistivity of the material reaches a constant value.

3. The process of preparing material having a predetermined high value of electrical resistivity comprising heating wood in an atmosphere substantially free from oxygen at a temperature sufficiently high to char it, until substantially free from volatile substances, grinding the resulting char and baking at a predetermined temperature above 500° C., according to the resistivity required, until the resistivity of the material reaches a constant value.

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