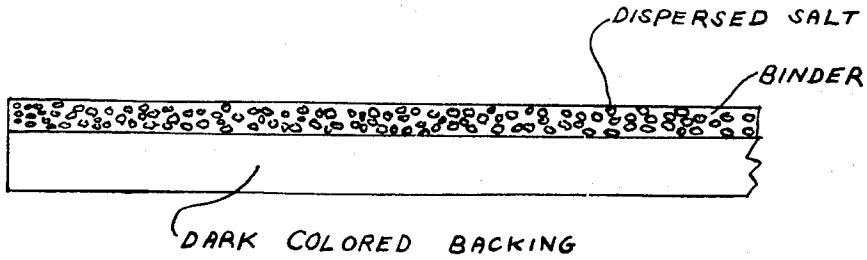
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HEAT-SENSITIVE COPYING SHEET

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HEAT-SENSITIVE COPYING SHEET

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This invention relates to heat-sensitive copying paper useful in preparing copies of printed matter or other graphic originals.

Heat-sensitive copying papers which operate by means of a physical change that is produced by heat are old in the art. U.S. Patent No. 2,710,263 and Reissue Patent No. 24,554 described heat-sensitive coatings for making copying paper in which the image appearing on the copy sheet results from a physical change in the coating corresponding to the image copied. According to the teachings of these prior art patents a heat-sensitive copying paper can be prepared by coating a dark colored supporting base with a composition consisting of particles of a normally transparent stable organic fusible solid, melting within the range of 60–115° C., dispersed in a solution of a transparent film-forming binder in a volatile solvent, evaporating the solvent without fusing or dissolving the particles so as to provide a non-transparent, infrared transmitting, heat-sensitive paper. A protective layer of film-forming material can be applied over the heat-sensitive layer if desired. Heating the sheet at temperatures corresponding to the melting point of the fusible solid melts the heat-sensitive coating and allows the dark colored base sheet to show through at the heated areas. In making copies of graphic originals the heated areas would correspond to the image on the original and would result from heat generated by exposing the original to high intensity infrared radiation. Preferably the copy is made by placing the copy sheet on the original with its uncoated side next to the original and then exposing the original through the heat-sensitive copy sheet. In an alternate technique, the original would be exposed to infrared radiation directly with the coated side of the heat-sensitive paper immediately back of it. By this "back-printing" technique it is not necessary, of course, that the heat-sensitive paper be infrared transparent. Both the "back-printing" and the "front-printing" techniques are described in the prior art patents mentioned above and also in U.S. Patent No. 2,859,351.

A problem which has hampered the use of heat-sensitive coatings of the type described in the afore-mentioned patents is that the pressure-sensitivity of such coatings is greater than is desirable; that is the coatings are easily bruised and marred during handling, thereby allowing the dark colored base sheet to show through.

I have now made novel heat-sensitive copying sheets of greatly diminished pressure sensitivity which comprise a non-metallic supporting base preferably of a dark color having thereon a visibly opaque heat-sensitive coating of a contrasting color. This coating comprises a thin film of a transparent film-forming organic binder having distributed therein particles of a hydrated salt formed by the reaction of an inorganic hydroxide, preferably a metal hydroxide with either an inorganic acid or any carboxylic acid such as acetic acid which produces an "inorganic" type of salt. These "inorganic" types of salt are soluble or decompose in hot (about 50° C.) water. In addition, the hydrated salts preferably have a melting point between 60° and 120° C. Some operable salts include hydrated aluminum sulfate, hydrated monobasic calcium phosphate and hydrated ferrous sulfate, as well as hydrated magnesium acetate, hydrated sodium acetate and hydrated sodium potassium tartrate.

The novel heat-sensitive sheets of this invention are prepared by forming a dispersion of the hydrated salt in a volatile organic solvent in which a film-forming binder is dissolved. In addition to binder, the solvent may also optionally contain plasticizer for the film to be formed.

The volatile organic solvent may be any conventional volatile organic solvent in which the selected hydrated salt is insoluble and in which the binder is soluble. The binder may be a polyacrylate such as polymethylmethacrylate, a cellulosic polymer such as nitro-cellulose or ethyl cellulose, a vinyl polymer such as polyvinyl chloride and polyvinyl acetate.

Any plasticizer which is compatible with the binder may be optionally used. Suitable plasticizers include, for example, n-butyl stearate, dibutyl phthalate, dibenzyl phthalate, tricresyl phosphate, tributoxy ethyl phosphate, butyl phthalyl butyl glycollate, ethyl-o-benzoyl benzoate, dibenzyl sebacate and dioctyl sebacate.

Preferably from 3 to 7 parts by weight of hydrated salt are used for each part of binder used and from 7 to 12 parts by weight of solvent are used for each part of binder used.

The base sheet may be any sheet conventionally used in making heat-sensitive copying sheets which operate by means of physical change. The whole base sheet or at least the surface of said sheet which is to be covered with the coating should be of a color contrasting with said coating, preferably a dark color.

Where the heat-sensitive sheets are to be employed in the production of copies of the "front-printing" technique, it is of course necessary that both the base sheet and coating be transparent to infrared light. Where, however, the "back-printing" technique is used, such infrared transparency is not a necessity.

It is to be noted that unless otherwise stated all proportions in the specification and claims are by weight.

The following examples will further illustrate the practice of the invention.

Example 1

The following ingredients:

	Parts by weight
$Al_2(SO_4)_3.18H_2O$	20.0
Methyl ethyl ketone	55.0
Polymethylmethacrylate having a melting point above 150° C. and a molecular weight of 334,000	5.0
n-Butyl stearate	3.0

are milled by suitable means such as a ball mill until the $Al_2(SO_4)_3.18H_2O$ has been formed into particles having a diameter in the order of 0.5 to 1 mil and uniformly dispersed throughout the mixture. The composition is then coated uniformly on a black carbonizing tissue as a coating having a thickness of 0.5 mil. The coating can be applied by conventional means, e.g., using a Mayer Rod coater. Upon drying a grayish-white opaque coating was produced. The resulting coated sheet is highly mar and scuff-resistant and has a very low pressure sensitivity. The heat-sensitive sheet may be used to produce copies by the "front" or "back" printing techniques using the Thermo-Fax copying machine.

Example 2

Using the following ingredients:

	Parts by weight
Hydrated magnesium acetate, $Mg(C_2H_3O_2)_2.4H_2O$	20
Methyl ethyl ketone	55
Polymethylmethacrylate	5
n-Butyl stearate	3

Example 1 is repeated. The heat-sensitive sheet produced has the same properties as that of Example 2 ex-

cept that the pressure sensitivity of the sheet of this example is even lower than that of Example 1.

Example 3

Example 1 is repeated using the same ingredients, proportions and conditions except that hydrated sodium acetate, $NaC_2H_3O_2.3H_2O$, is used instead of hydrated aluminum sulfate. The heat-sensitive sheet produced has the same properties as that of Example 1.

Example 4

Example 1 is repeated using the same ingredients, proportions and conditions except that hydrated ferrous sulfate, $FeSO_4.7H_2O$, is used instead of hydrated aluminum sulfate. The heat-sensitive sheet produced has the same properties as that of Example 1.

Example 5

Example 1 is repeated using the same ingredients, proportions and conditions except that hydrated potassium sodium tartrate, $NaKC_4H_4O_6.4H_2O$, is used instead of hydrated aluminum sulfate. The heat-sensitive sheet produced has the same properties as that of Example 1.

Example 6

Example 1 is repeated using the same ingredients, proportions and conditions except that hydrated monobasic calcium phosphate, $CaH_4(PO_4)_2.H_2O$ is used instead of hydrated aluminum sulfate. The heat-sensitive sheet produced has the same properties as that of Example 1.

The drawing is a schematic illustration of the copying sheet of this invention.

While there have been described what is at present considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is

1. A heat-sensitive copying sheet comprising a non-metallic supporting base and a visibly opaque heat-sensitive coating of contrasting color thereon comprising a thin film of a transparent film-forming organic binder having a dispersion therein consisting essentially of particles of a hydrated salt selected from the group consisting of hydrated aluminum sulfate, hydrated monobasic calcium phosphate, hydrated ferrous sulfate, hydrated magnesium acetate, hydrated sodium acetate and hydrated potassium sodium tartrate from 3 to 7 parts by weight of said hydrated salt being present for each part of the binder.

2. The heat-sensitive copying sheet defined in claim 1, wherein said particles are hydrated aluminum sulfate.

3. The heat-sensitive copying sheet defined in claim 1, wherein said particles are hydrated monobasic calcium phosphate.

4. The heat-sensitive copying sheet defined in claim 1, wherein said particles are hydrated ferrous sulfate.

5. The heat-sensitive copying sheet defined in claim 1, wherein said particles are hydrated magnesium acetate.

6. The heat-sensitive copying sheet defined in claim 1, wherein said particles are hydrated sodium acetate.

7. The heat-sensitive copying sheet defined in claim 1, wherein said particles are hydrated potassium sodium tartrate.

8. The heat-sensitive copying sheet defined in claim 1, wherein said organic binder comprises polymethylmethacrylate.

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