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PROCESS FOR EXTINGUISHING FIRES WITH GRAPHITE CONTAINING FOAM-COMPATIBLE FIRE EXTINGUISHING POWDERS

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6 Claims

ABSTRACT OF THE DISCLOSURE

To render powdered fire-extinguishing agents compatible with fire-extinguishing foams, for example foams based on proteins, a minor proportion of graphite is incorporated in the powder. Examples of foam-compatible compositions so obtained are mixtures of sodium bicarbonate or potassium bicarbonate, or the fire-extinguishing agent made by heating urea with potassium bicarbonate below 150° C., with finely divided graphite the proportion of the latter in the mixture being 0.01 to 10% by weight. Free-flowing and anti-caking agents may be included in the foam-compatible compositions.

This invention relates to fire-extinguishing compositions of the dry powder type and particularly to those having compatibility with protein-stabilised mechanical foams.

Dry sodium and potassium bicarbonates and dry powdered materials based on or derived from them are efficient agents for extinguishing fires including liquid fuel fires. They possess good heat-shielding properties and rapidly generate an atmosphere unfavourable to flame propagation. These properties make them desirable for use together with mechanical foams, for example protein-based foam, in attacking hydrocarbon fires, for example those associated with aircraft.

However these powdered materials are sometimes incompatible with mechanical foams in that when the two are applied together under fire fighting conditions the foam blanket collapses almost as soon as it comes into contact with the burning fuel. This collapse may be caused by the powders dissolving in contact with water in the foam and thereby producing ions, possibly hydroxyl ions, that disrupt the stabilising protein films at the surfaces of the bubbles. Surface-active agents, for example stearic acid and metal stearates, present in the dry powders for the purpose of keeping them free-flowing tend to encourage this disrupting action.

Surface-active agents of the type mentioned can be replaced by polysiloxanes, which have no effect on the foam and which impart water-repelling properties to the powders, but in spite of this some dissolution does occur and gives rise to ions that still lead to an unacceptably high rate of breakdown of foam.

If a substance could be found that stabilised foam in presence of ions derived from the powder it would be possible by mixing it with the powder to prevent foam-breakdown due to the powder or at least reduce its extent to an acceptable level.

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We have found that graphite when mixed in a finely divided state with the dry powder exerts the desired stabilising effect.

The invention thus in its general form provides dry, powdered fire-extinguishing compositions suitable for use together with foams in combating fires characterized in that said compositions contain a minor proportion by weight of finely-divided graphite.

In one particular form the invention provides dry, powdered fire-extinguishing compositions comprising an alkali metal bicarbonate and a minor proportion by weight of finely divided graphite.

In yet another particular form the invention provides dry, powdered fire-extinguishing compositions comprising one or more of the compositions of matter made by heating a mixture of urea and at least one alkali selected from bicarbonates, sesquicarbonates, carbonates and hydroxides of sodium and potassium at temperatures below 150° C., as described in copending application S.N. 676,907, filed Oct. 20, 1967, and a minor proportion by weight of finely divided graphite.

By a minor proportion is to be understood that from 0.01% to 10.0% by weight of the dry, powdered fire-extinguishing composition consists of graphite.

Free-flowing and anti-caking additives may be included in the compositions of the invention, for example finely-divided silica, talc, polysiloxanes.

An example of a dry, powdered fire-extinguishing composition according to the invention is as follows: all parts are by weight:

900–990 parts of substance A
5–100 parts of finely-divided silica
1–20 parts of a polysiloxane
1–50 parts of graphite

in which substance A represents sodium bicarbonate, or potassium bicarbonate or one of the compositions described in application S.N. 676,907.

Foam compatibility can conveniently be measured by the method described in U.S. Naval Research Laboratory report No. NRL 5329 by E. J. Jablonski and R. L. Gipe dated June 23, 1959—"A New Method for Determining the Degree of Compatibility of Dry Chemical Powders with Mechanical Foams." Briefly the method measures average drainage-rates of liquid from foam, and a material is considered to be compatible with a foam if the average drainage-rate of a standard foam dusted with a standard weight of the material is no greater than twice the drainage-rate of foam alone.

The invention is illustrated by the data given in the Tables 1 and 2 which show the results of foam compatibility tests carried out according to the method referred to hereinbefore. Table 1 contains the results obtained with dry, powdered sodium bicarbonate, potassium bicarbonate and substance K which is the material obtained by heating potassium bicarbonate with urea at a temperature below 150° C. as described in application S.N. 676,907. The foam was made from a protein-type concentrate. The silica was a finely divided proprietary material having an average particle-size less than 50 millimicrons, the surfactant was calcium stearate and the polysiloxane was substantially tetramethylcyclotetrasiloxane. The numbers in the column of the table headed by the respective fire-extinguishing materials are the ratios of average drainage-rate of foam plus material to average drainage-rate of

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foam alone. The column headed "additive" shows the substances added to the foam/dry powdered material system. Percentages are by weight.

TABLE 1

Additive	Dry powdered material		
	NaHCO ₃	KHCO ₃	Substance K
Nil	3.7	8.2	6.4
2% silica	7.0	9.3	8.6
2% silica and 1% surfactant	17.1	14.2	13.7
2% silica and 1% polysiloxane	2.1	2.8	2.6
2% silica and 1% graphite	1.7	1.7	1.5

Table 2, in which percentages are by weight, shows the results of further foam compatibility tests carried out with mixtures of substance K and graphite, and, for comparison, mixtures of substance K and various other additives that might be expected to possess foam-stabilizing properties, among which the polysiloxane was substantially tetramethylcyclotetrasiloxane, and the silicone-treated silica was a finely-divided proprietary silica having an average particle-size less than 50 millimicrons and containing 20% by weight of a silicone. The ratios in the righthand column are of drainage-rates of foams plus substance K plus additive to drainage-rate of foam alone.

TABLE 2

Additive:	Ratio of drainage rates
1.0% graphite	2.1
2.0% graphite	1.7
3.0% graphite	1.8
2.0% talc	6.0
2.0% silicone-treated silica	4.0
4.5% alginic acid	6.0
2.0% polysiloxane	5.0
5.0% copper acetate	3.0
5.0% ferric acetate	4.0
5.0% ferric oxide	13.0

What we claim is:

1. In a process for extinguishing a liquid fuel hydrocarbon fire comprising applying to the fire an aqueous mechanical foam together with a hydrocarbon fire-fight-

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ing dry powder, the improvement comprising applying as the said dry powder an alkali metal bicarbonate or material made by heating a mixture of urea and at least one alkali selected from bicarbonates, sesquicarbonates, carbonates and hydroxides of sodium and potassium at temperatures below 150° C. and wherein the said dry powder also contains from 0.10% to 10.0% by weight of graphite, whereby the said dry powder is substantially compatible with the said foam and reduces the drainage rate of the said foam in contact with the said powder.

2. A process as claimed in claim 1 wherein the dry powder also contains free-flowing and anticaking agents.

3. A process as claimed in claim 2 wherein the free-flowing and anticaking agents are selected from finely divided silica, silicones, finely divided silica containing silicones, polysiloxanes and calcium stearate.

4. A process as claimed in claim 1 wherein the dry powder is the material made by heating urea with an alkali selected from potassium bicarbonate and potassium carbonate at temperatures below 150° C.

5. A process as claimed in claim 1 wherein the proportion of graphite is from 0.50% to 3% by weight.

6. A process as claimed in claim 5 wherein the dry powder also contains free-flowing and anticaking agents.

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