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NASA TECH BRIEF

Potassium Silicate Zinc Dust Coating

One of the principal difficulties attendant to metal coating or painting is the cracking and crazing of the finish during the drying period. The coating described here is not subject to cracking or crazing and, in addition, is fire retardant and has high adhesive qualities. The solution preferably contains methyltrimethoxysilane to enhance these properties.

The successful use of potassium silicate as a binder for zinc dust formulations is dependent on keeping the mol ratios of dissolved silica to potassium oxide high, preferably in the range 4.8:1 to 5.3:1. Lower ratios provide a coating subject to greater moisture sensitivity during the initial drying (cupping) stages after application. Ratios higher than the quoted optimum are difficult to make., and give binders which promote premature crystallization reactions.

The potassium silicate solution is designated 19-23K 4.8-5.3. The first number refers to the percent by weight of potassium silicate in the aqueous solvent; the second refers to the mol ratio of silica to potassium oxide. The other requisite component, zinc dust, is added in amounts 6 to 27 times the percentage by weight of the silicate solids. While the particle size of the zinc dust is not critical, the preferable size is in the 3 to 50 micron range (usually, the finer the better). To this combination is added lower alkyl, lower alkoxysilane, preferably in the form of methyltrimethoxysilane, in amounts up to 3 percent by weight. Compatible fillers and dyes may be added, provided they do not affect the desired coating properties.

The substrates to which the coating is applied are generally metallic. For optimum results, the surface should first be cleaned with phosphoric acid or by sand blasting. Application may be performed by standard techniques; the most uniform finish is obtained by spraying.

Some specific examples of formulations are listed below. Each of the formulations was sprayed on a steel surface, air-dried at ambient temperature for four hours and microscopically examined. In each case a firm adhesive base was produced. The compositions containing methyltrimethoxysilane appeared tougher (more adherent when subjected to scraping tests) and evidenced a glossier finish.

Example I

Component	Parts by Weight	Percent by Weight
Potassium silicate solids 20K5.3	64.5	21.0
Methyltrimethoxysilane	2.0	0.6
Zinc dust	240.0	78.4
	306.5	100.0

Example II

Component	Parts by Weight	Percent by Weight
Potassium silicate solids 22K4.8	64.5	26
Zinc dust	180.0	74
	244.5	100

Example III

Component	Parts by Weight	Percent by Weight
Potassium silicate solids 22K4.8	64.5	21.2
Methyltrimethoxysilane	2.0	0.6
Zinc dust	240.0	78.2
	306.5	100.0

Example IV

Component	Parts by Weight	Percent by Weight
Potassium silicate solids 20K5.3	64.5	21.2
Zinc dust	240.0	78.8
	304.5	100.0

(continued overleaf)

Note:

Requests for further information may be directed to:

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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

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