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Inorganic Paint Is Durable, Fireproof, Easy to Apply

The problem: To develop a paint that is fireproof, inert to ionizing radiation, and highly adherent to various surfaces exposed to a wide range of temperatures.

The solution: A series of completely inorganic paints formulated with an alkali-metal silicate solution (e.g., a water solution of potassium silicate) as a vehicle, a phosphate (e.g., aluminum orthophosphate) as a wetting agent, a pigment (e.g., titanium dioxide) as a coloring agent and filler, and water as a thinner. Various other inorganic materials, including standard pigments, can be added to or substituted in the basic formulation to obtain paints having a wide range of desirable characteristics for special applications.

How it's done: The paints are prepared by thoroughly blending proportioned amounts of the inorganic ingredients in the proper order. A filler-spreader dispersion is first formed by mixing the inorganic phosphate with water. A water solution of the alkali-metal silicate, required pigments, and other ingredients are then mixed into the filler-spreader dispersion. The following is a typical paint formulation incorporating titanium dioxide as a white pigment, aluminum hydroxide to increase the shelf life of the paint, and boric acid to harden and make the paint coating more impervious to water.

Ingredient	Percent by Weight	
	Typical	Range
Potassium silicate (35% solution)	41.5	38 -70
Aluminum orthophosphate	0.3	0.1- 0.6
Water	16.2	14 -18
Titanium dioxide	24.9	20 -35
Aluminum hydroxide	16.6	15 -35
Boric acid	0.5	0.3- 1

Potassium hydroxide added to the formulation reacts chemically to produce filler material which improves the flexibility, adhesion, and cleanability of the paint coating. The opacity, as well as the water resistance of the coating, can also be improved by adding antimonous sulfide to the paint mixture.

Notes:

1. The paints can be applied directly to various materials, including aluminum, steel, plastics, and ceramics, by conventional methods such as spraying, brushing, and dipping. Painted surfaces can be air dried at room temperature or elevated temperatures. Stainless steels and certain plastics require the use of a primer coat to ensure proper adhesion of the paint. In some cases a sealant can be applied over the paint to eliminate porosity and improve water resistance. Appropriate primer and sealer compositions have been developed for special applications.
2. Fifteen different inorganic paint and primer compositions in this series have been formulated and tested. These paints, which are simply and inexpensively prepared in a variety of colors, have excellent shelf lives and are easily applied to provide coatings that are generally stable, fireproof, adherent under wide temperature fluctuations, waterproof, hard, and tough.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10156

(continued overleaf)

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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