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NASA TECH BRIEF

Marshall Space Flight Center

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Nonflammable Organic-Base Paint for Oxygen-Rich Atmospheres

New paint formulations which combine commercial aqueous latex paints (organic-resin emulsions in water) with inorganic pigments and additives produce coatings that are nonflammable or self-extinguishing in pure oxygen gas at pressures up to twice the partial pressure of oxygen in the atmosphere. Unlike most fireproof inorganic paints, the new paints form adherent, highly flexible coatings on properly prepared materials, including wood, metal, concrete, and wallboard. In addition, the paints can be formulated for spray, brush, or roller application, and can be used on interior and exterior surfaces. Applications include buildings, aircraft, ships, and land vehicles, as well as areas where liquid or gaseous oxygen is present.

The basic nonflammable paints are prepared by mixing a commercially available aqueous suspension of a synthetic mica, potassium silicate, and any one of a variety of aqueous latex paints (aqueous resin emulsions). Various proportions of inorganic pigments and other inorganic ingredients may be added to the basic paint compositions to impart the desired color and reflectance characteristics. The ratio of inorganic suspension to resin emulsion can be controlled to produce a paint combining the nonflammability of inorganic coatings with the lower-temperature curing and superior physical properties of standard organic-resin paints. A nominal paint formulation, in percent by weight, that will provide a nonflammable, optically reflective coating is given below:

Aqueous synthetic mica suspension (4.1% by wt, solids)	15.6
Aqueous potassium silicate (35% by wt, solids)	13.1
Hollow glass microspheres (35 to 45 microns diameter)	3.4
Inorganic pigment	19.5
Aqueous emulsion of polyvinyl acetate-butyrate (41.8% by wt resin content, including 3.3% by wt calcium silicate)	14.3
Water (balance)	34.1

Paint mixtures with different ratios of inorganic suspension to resin emulsion within a prescribed range were applied to various panels, cured at room temperature for 48 hours, and then cured at 344°K (160°F) for 72 hours. All of the resultant coatings were nonflammable when in contact with gaseous or liquid oxygen. After exposure to exterior weathering for 10 months, coated metal panels, concrete blocks, and wallboard showed no signs of cracking or peeling, and their color fastness was equal to or better than that of coatings formed from conventional exterior paints. Shelf life of the paints, when stored at room temperature in airtight containers, exceeded 12 months. Specimen coated panels showed no change after cycling between cryogenic temperatures and 356°K (180°F). Specimens of a white coating tested showed an emissivity of 0.8 and a solar absorptivity of 0.16 to 0.30, depending on film thickness.

Although the coatings showed excellent resistance to moisture, they are porous and will not present a protective barrier against corrosion from salt spray. For use in salt spray atmospheres, coatings on susceptible metal surfaces should be sealed with

(continued overleaf)

a fluorocarbon polymer, or the underlying metal surfaces should be pretreated against corrosion (as in anodizing aluminum alloys).

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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