

NASA TECH BRIEF

Goddard Space Flight Center



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Ultraviolet Reflective Coating

The problem:

Barium sulphate has a relatively high reflectance over the spectrum of ultraviolet light within the range of 200.0 to 400.0 nm. For this reason, barium sulphate in combination with a binder is frequently used as a pigment in ultraviolet light reflective coatings. Presently used binders, however, reduce the overall effectiveness of the pigment to a range of 290.0 to 400.0 nm. Although such a reduction in efficiency is not objectionable in most applications, it is detrimental to the collection efficiency of the coatings used inside Cerenkov radiation detectors.

The solution:

A coating composition has been developed which preserves the full ultraviolet reflectance range of barium sulphate.

How it's done:

In general, the coating composition consists of a dispersion of barium sulphate in an aqueous solution of a water-soluble inorganic binder. The binder is selected from the group consisting of alkali metal sulphates. The preferred binder, in this case, is potassium sulphate. Because the coating composition has an acidic pH, approximately 4.7, it is applied in conjunction with an alkaline primer system to avoid corrosion of the substrate surface. The alkaline primer is a dispersion of aluminum oxide in an aqueous solution of potassium silicate having a pH of 12. The resulting acid-base coating comprises a rather complex system of potassium salts, barium sulphate, silicic acid, and, to a lesser extent, aluminum oxide. Since the primer is water sensitive, its application with its lower pH causes the silicic acid and aluminum oxide potassium salts to discharge by releasing potassium ions in exchange for protons. By the common ion effect then, the potassium sulphate will deionize and precipitate in the interstices of both coatings. Hence, the alkalinity of the prime coat serves to prevent the growth of potassium sulphate crystals, which, with the

common ion effects derived from sulphate as an intra-coating effect and potassium as an intercoating effect, serves to give enhanced binding to the barium sulphate powder.

The reflective coating composition may be applied over an alkaline primer to a wide variety of suitable substrates including, for example, epoxy-fiberglass laminates and various metals such as aluminum, iron, or steel. Application of the coating is carried out while the coating composition is in its freshly prepared state, before equilibrium is established.

The coating exhibits high reflectance of ultraviolet light to wavelengths of approximately 200.0 nm, which compares favorably with the high reflectance of the virgin barium sulphate powder.

Notes:

1. Several different coating compositions have been formulated by varying the proportion of the described constituents.
2. Requests for further information may be directed to:
Technology Utilization Officer
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Reference: TSP73-10469

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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