EPOXY RESIN POWDER COATINGS

Powder coatings are produced by melt blending homogenous dispersions of nonvolatile solid resins, curing agents, pigments, fillers, and various additives. The dispersion is solidified by cooling, ground into a finely divided powder form, and classified for subsequent use. The resultant powder is normally electrostatically deposited onto grounded substrates and, through the application of heat, converted into very high performance thermoset films. The process of applying coating powders allows nearly 100% powder utilization and evolves almost no volatile organic compounds.

The 1970's volatiles regulations and energy concerns raised interest in powder coating technology. The real sustaining driving forces for growth, however, have been improvements in powder coating raw materials, formulations, manufacturing technology, and application equipment. The advantages for the use of powder coatings can best be summed up in the "Four E's," used by The Powder Coating Institute: (1) excellence of finish, (2) economy in use, (3) energy efficiency, and (4) environmental acceptability. The Clean Air Act, as amended in 1990, has contributed to even greater interest in the use of powder coatings to meet more stringent volatile organic requirements. Powder coatings is the fastest growing area of coatings technology. Growth rate for powder coatings in the 1990 to 1995 time frame is projected to be at 10 to 12% versus a conventional "wet" coatings rate of about 2%.

The unique characteristics of solid epoxy resins account for their choice by formulators for use in powder coatings applications. Bisphenol-A based epoxides with equivalent weights greater than about 650 are nonsintering and extremely friable. They have relatively low melt viscosity and high reactivity via the terminal oxirane functionality. The addition reaction with amines, phenolics, or carboxylic acid functional curatives allows a wide range of formulations. The primary limitations for bisphenol-A based epoxy resins in powder coatings are yellowing and loss of gloss that occur when these coatings are exposed to exterior weathering conditions.

Powder coatings are broadly divided into either "functional" or "decorative" uses. Functional coatings are normally applied at film thicknesses greater than about 3 mil and are expected to withstand some rather severe service. Examples of functional uses are coatings for exterior and interior pipe, rebar, and various electrical devices. Although decorative powder coatings are functional, these are normally used at a film thickness of 3 mil or less and are not expected to perform significantly better than baked films derived from "wet" coatings. Some examples of decorative uses are coatings for appliances, furniture, and underhood automotive parts.

REFERENCES

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