PROJECT REPORT

NEW LATICES FOR TAPE JOINT COMPOUND BINDERS: COST REDUCTIONS WITH ACRYLIC ACID COPOLYMER STABILIZERS

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SUMMARY UCAR Latex 130 is a vinyl acetate homopolymer latex. A plasticized version, UCAR Latex 131, now holds a dominant position in the tape joint compound binder market. This position has been threatened recently by competitive latices, mainly ethylene-vinyl acetate copolymers, which have been reported to offer significant cost savings because of their greater efficiency.

The purpose of the current project is to stop the erosion of our present market position. The goal is to achieve a significant reduction in the cost of UCAR Latex 130 while not sacrificing any performance properties of the product. CELLOSIZE hydroxyethyl cellulose is used as the protective colloid in UCAR Latex 130. Since this material constitutes approximately twenty percent of the raw materials cost of the final product, a search was begun to find a lower cost stabilizer.

Several poly(vinyl acetate) latices, stabilized by lower cost in situ polymerized acrylic acid containing copolymers, have been produced in the laboratory. When plasticized with dibutyl phthalate, some of the latices have shown performances equal to and in some cases better than UCAR Latex 131.

A process for producing a 30/40/30 butyl acrylate/acrylic acid/vinyl acetate terpolymer stabilized latex (TPX-6303) has been developed in the laboratory and tested in the pilot plant. This product and process offer a cost saving of 2.5 cents per wet pound over UCAR Latex 130. Customer testing of the material from the pilot plant has confirmed that its performance is equivalent to UCAR Latex 130 in all areas except workability and cold, humid adhesion. Recommendations for optimizing this product are described in this report.

Ethyl acrylate/acrylic acid/vinyl acetate terpolymer stabilized latices are currently being studied. These products have shown consistently better performance than the butyl acrylate terpolymer stabilized products described in this report. Ethyl acrylate terpolymer stabilized, internally plasticized latices are also being studied. Both of these investigations will be described in subsequent reports.

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procedure for producing this stabilizer was the same as that used to produce the stabilizer for 3RLZ3 except for the inclusion of the butyl acrylate in the monomer mixture. The stabilizer was also in a different form; it was a latex rather than a solution. Table I indicates that the latex stabilized with this BA/AA/VAc type stabilizer gave a significant improvement in the low temperature performance as compared with either the CELLOSIZE stabilized product or the AA/VAc stabilized latices. This is expected by virtue of the lower glass transition temperature of the stabilizer containing the butyl acrylate.

Other acrylates were used to reduce the glass transition temperature of the stabilizer with varying success. Replacing all of the butyl acrylate with 2-ethylhexyl acrylate resulted in a product filled with scrap. Increasing the acrylic acid content to 50 percent did not relieve this problem which may be due to the extreme hydrophobicity of the 2-ethylhexyl acrylate. The butyl acrylate was also replaced by an equal weight of ethyl acrylate. The same procedure used to produce the stabilizer for 3RLZ3 was followed except that the feed time was reduced to six hours. This was possible because of the better reactivity ratios between the monomers when ethyl acrylate is used.

As a result of a trend towards asbestos free tape joint formulations, all further testing of the experimental tape joint latices was carried out in asbestos free formulations. Dr. W. D. Massey of the Trade Finish Applications group, who did all of the testing of these latices, developed the asbestos free formulation (2WDM29). Table II lists the performance levels of UCAR Latex 131 and the two copolymer stabilized latices containing ethyl acrylate or butyl acrylate after plasticizing to the same level as UCAR Latex 131. In this formulation UCAR Latex 131 and the BA/AA/VAc stabilized latex had comparable performance while the EA/AA/VAc stabilized latex was superior, especially in low temperature performance. More importantly, however, the raw materials cost for either of the copolymer stabilized latices is approximately 2.5 cents/wet pound lower than UCAR Latex 130 (2). This improved low temperature performance was unexpected in view of the higher glass transition temperature for the EA/AA/VAc stabilizer (34°C for the EA/AA/VAc product versus 19°C for the BA/AA/VAc stabilizer). Because of the better reactivity ratios between the various monomers when ethyl acrylate is used, this increased performance could be the result of a more uniform copolymer composition or possibly a result of the more hydrophilic nature of the stabilizer made with the ethyl acrylate.

UNIFORMITY OF STABILIZER COMPOSITION

Uniformity of the stabilizer is an important consideration. Attempts to reduce the feed time significantly for either of the stabilizers described above resulted in a build-up of the least