CRYOSEM INVESTIGATION OF FREEZING AND THAWING OF LATEX PAINT

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Cryogenic scanning electron microscopy (CryoSEM) is a powerful method for characterizing microstructure in liquid-applied coatings. The technique involves freezing coatings to arrest structure changes and render the specimens stable for investigation in the high vacuum environment of the SEM. CryoSEM is particularly well suited to the study of latex and other particulate coatings. In this research, we explore the changes in structure that occur as a model latex paint is frozen and thawed and relate them to stability under freezing and thawing cycles. The microstructures of model paints, prepared with and without propylene glycol, were studied by cryoSEM after freezing at controlled rates, and after freezing and thawing cycles. The results showed that the freezing process creates microstructures that contain ice crystals and zones that are rich in particles. The propylene glycol additive results in frozen structures with larger sized ice crystals. Microstructures after thawing range from completely dispersed to highly aggregated. Increasing the amount of propylene glycol and increasing the thawing rate resulted

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in more highly dispersed specimens. Based on the cryoSEM results, we propose a mechanism for particle aggregation during a freeze-thaw cycle (Mittal et. al., 2012).

Reference:

Mittal, M.; Roper III, J A.; Jackson, C. L.; Monaghan, G. G.; Francis, L. F., "Effects of Freezing and Thawing on the Microstructure of Latex Paints", submitted for publication, 2012.