

Abstract: The shrinkage stresses that are created in the application of modern commercial and homemade art and conservation paints, media, and gesso based on synthetic polymers have been measured. Commercial art products tended to dry to essentially stress-free films. Coatings formulated with hard (high T_g or Young's modulus) polymers, however, tended to dry with substantial shrinkage stresses, and those stress levels increased with pigment loading up to the critical pigment volume concentration. In these tests, some films were produced having drying stresses that exceeded the cohesive or adhesive strength of the coating. Even for coatings that remained intact after drying, residual stresses remained in the films, which would leave them at greater risk of subsequent damage from additional applied stresses due to environmental changes or handling. Material analyses to determine the nature of the coating resin or paint binder may provide some means of assessing the likelihood of residual drying stresses being present, although stress measurements on the particular materials found would be needed to estimate the magnitude of those stresses. Treatments to relieve the stresses in coatings may be possible, but extensive testing on the specific material combinations identified on the artifact is necessary to determine the safety and efficacy of the method. Climate control and careful handling, to minimize additional stresses on objects that may be at risk, are the most prudent steps currently available.