

A Predictive Model for the Hydroplasticization of Latex Co-polymers

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Abstract

In an aqueous environment, a copolymer's glass transition temperature (T_g) can be significantly depressed due to plasticization of its more polar groups by water. This hydroplasticized glass transition temperature plays an important role in particle morphology development during polymerization and with the polymer's minimum film formation temperature during application. The relevancy of the polymer glass transition temperature to both morphology and film formation is well appreciated, however the transition related to the polymer's dry state is most often, and incorrectly, used. In response to this need, we have developed a predictive model for hydroplasticization that has been shown to agree well with experimentally measured glass transitions for a range of copolymers measured in the fully hydrated state by microcalorimetry. Three readily available properties are needed for prediction of the hydroplasticized T_g . These are 1) the glass transition temperature of the polymer in the dry state, 2) the degree of water sorption of the comprising polymers in the saturated state, and 3) a value for the T_g of water. The development of the predictive model and its experimental validation will be described, including the sensitivity to the degree of ionization of carboxylic acid functional groups in the copolymer.