Investigating the Influence of Particle Morphology on the Performance of Core-Shell Latexes

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Multiphase core-shell latex particles can deliver the film forming ability of low glass transition temperature (T_g) polymers and the mechanical stability of high T_g polymers in a single particle without the use of volatile coalescing aids. Understanding how particle morphology influences both film formation and stress development is crucial for achieving optimal performance in these materials. For this study, soft core-hard shell particles with varying particle sizes, core and shell T_gs, and shell thicknesses were synthesized by a semi-continuous two-stage emulsion polymerization. The film formation behavior of these materials was characterized by atomic force microscopy, cryogenic scanning electron microscopy (cryoSEM), and minimum film formation temperature measurements. Results show that film formation favors smaller particle sizes, thinner shells, and a lower glass transition temperature difference between the core and shell polymers. Stress development in the films was influenced by the same parameters. To monitor stress evolution in the absence of lateral drying, a walled cantilever design was used to suppress edge effects and promote uniform drying. Additionally, the film formation behavior and stress development of these materials display good correlations with practical paint properties like scrub resistance, block resistance, and gloss.

Reference:

Price, K. K.; Wu, W.; Wood, K.; Kong, S.; McCormick, A.; Francis, L. F. Stress development and film formation in multiphase composite latexes. (In Press) *J. Coatings Technol. Res.* DOI: 10.1007/s11998-014-9606-7