Kinetics of Film Formation in Mixtures of Latex Studied with Spectroscopic Ellipsometry and Environmental SEM

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Mixtures of latex are used to tailor material properties and to create functional materials inexpensively. Even though there is an obvious technological need to mix latex compositions, the film formation process has not been extensively studied in these systems.

An investigation into the mechanisms of film formation has been conducted using a unique combination of two recently-developed techniques. Spectroscopic ellipsometry was used to observe optical changes associated with all stages of film formation of latex, starting from a wet coating and continuing through particle coalescence and autohesion. Environmental scanning electron microscopy (ESEM), which allows in-situ, real-time observation, has been used to correlate these optical data with microsctructural changes in partially-wet and dry latices.

It was found that the onset of film formation, indicated by an abrupt change in optical clarity, coincides with particle re-arrangement and packing to eliminate larger interparticle pores. Particle identity is retained at this stage. Gradually, particles deform and coalesce to produce an even denser material. The addition of a "hard" (high glass transition temperature, Tg) to a "soft" (low Tg) latex does not alter the time required for the onset of film formation. With more hard latex particles in a mixture, however, the coalescence is slower as a consequence of the soft particles needing to deform around the hard particles.