

Self segregation in water-borne latex coatings

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Abstract

Paints and coatings are composite materials made from components which impart various properties on the final dried application. In certain situations it is preferable to have a component in just one section of the film, for example anti-fouling or self cleaning agents at the film/air interface, or an increased amount of adhering particles at the substrate.

A theory for developing a novel method of segregation during drying of a two component latex film has been derived mathematically. Through modelling of the diffusion behaviour as a coupled PDE system it is clear that two components, ideally with Peclet numbers either side of unity, will preferentially segregate.

Experimentally, Atomic Force Microscopy was used to image the surfaces of films formed from a mixture of two monodisperse acrylic latices of differing sizes. The films were dried at varying evaporation rates. Through image analysis the surface composition was able to be determined. A greater number of small particles were found on the surface at lower evaporation rates, thought to be due to either surface energetics or small recirculation flows.