

Applications of Environmental Scanning Electron Microscopy in the study of drying latex films

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Environmental Scanning Electron Microscopy (ESEM), which offers the possibility to image specimens in their natural 'wet' state, has been successfully applied in the study of a large number of materials and dynamic processes, including latices and film formation (1). Latex, which is an example of a wet insulating material, and is commonly used for the production of architectural coatings and adhesives, has recently been the subject of extensive research, due to the future implementation of the stringent EU and DEFRA requirements for minimization of the content of Volatile Organic Compounds (VOC) used (2).

In this study, we have employed ESEM to examine the drying behaviour of a new acrylic latex composition, stabilised with a novel polysaccharide, derived from agricultural waste, which offers an alternative way for the production of VOC-free latex paints. It was found that in the wet state the latex consists of clusters and individual particles that during drying formed a discontinuous film with voids present within its structure, which is inconsistent with the classical descriptions of film formation (3). Based on the experimental evidence, we propose an alternative film formation mechanism for the novel latex system.

The microstructural changes that take place upon aging were also studied by means of ESEM, EDX analysis and mechanical testing. It was found that the presence of small amounts of salt, a substance historically used in latex production, can lead to dendritic crystallization and hence significantly affect the properties of the aged latex specimens. A final consideration is given to the future developments and applications of ESEM to latices and colloidal systems in general.

References

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