Studying Microstructure of Coatings to Understand Formulation Effects on Function

Simon Gibbon[1], Chi Lo[2,3], Apoorva Ambarkar[2,3], Lee Fielding[3], Stephen Edmondson[3], Keimpe van den Berg[3], Bob Luigjes[3]
1 AkzoNobel, Stoneygate Lane, Felling, Gateshead, Tyne & Wear, NE10 0JY England, UK
2 School of Materials, The University of Manchester, M13 9PL Manchester, England, UK
3 AkzoNobel, Rijksstraatweg 31, 2171 AJ Sassenheim, The Netherlands
Contact Email: simon.gibbon@akzonobel.com

Organic coatings are complex formulated systems which need to provide multiple functions in the liquid state, while drying and finally as coatings. Formulation attempts to optimise all these functions, new insights from micro-structural characterisation of coatings is providing new approaches to formulation, as highlighted in these two different coating systems.

Formulation additives are essential in waterborne direct-to-metal (DTM) coatings for attainment of coherent and visible defect-free film formation to prevent premature failures. However, difficulties in selecting the appropriate additive package often leads to time-consuming experimentation based on ‘trial-and-error’ approaches. In this work, scanning electron microscopy (SEM) and atomic force microscope infrared spectroscopy (AFM-IR) techniques were used to elucidate the additive-induced microstructural changes under corrosive environments, and perform nanoscale chemical functionality mapping to investigate the long-term coating deterioration mechanisms. This knowledge provides deeper insight into the relationships between binder/additive structures, film morphologies and the associated anticorrosive properties.

Fundamental understanding of organic coating microstructure, may hold the key to understand failure mechanism in intact coatings. AFM-IR is a technique which allows microstructural characterization of organic coatings by mapping their infrared absorptions. Studies on crosslinked polyesters for food-contact applications conducted using this technique reveal intriguing results on sub-micron heterogeneity and phase separation.

Back to Programme