

Drying mechanism of waterborne coating



Application

Paint

Objective

Detail the 4 stages of the drying of a waterborne coating

Device

HORUS®

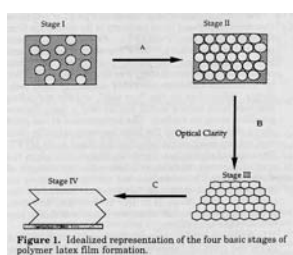


Figure 1. Idealized representation of the four basic stages of polymer latex film formation.

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INTRODUCTION

The coating industry is facing nowadays an increase of environmental regulations, imposing a substitution of toxic components and solvents. As a consequence, water-based coatings are in constant growth and the need of improving performances is ever increasing. However, these new formulations undergo new film formation processes that influence the coating properties and need to be measured as thoroughly as possible.

COMMON METHOD

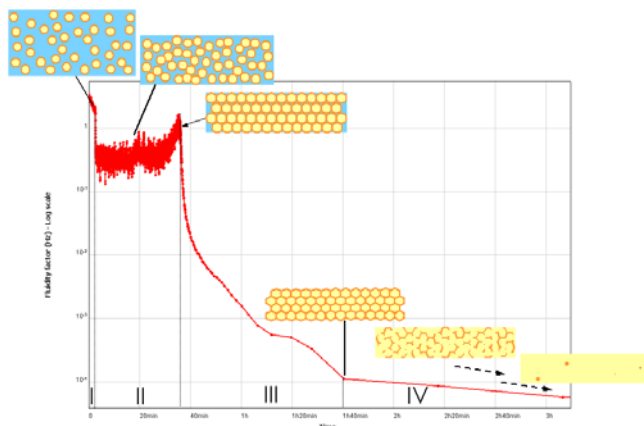
Film formation from latex dispersions or emulsions can be studied using different techniques such as AFM, Electron microscopy, Light microscopy, Gravimetric analysis, Thermal analysis (DMA, DSC...), Magnetic Resonance profiling, Spectroscopy (IR, Raman), Ellipsometry, *etc.* However, **these techniques often do not allow to follow the build-up of the film in real time, under realistic conditions of evaporation and on the appropriate substrate.**

HORUS® METHOD

The film formation process of water-based coatings can be monitored on any type of substrate (glass, metal, plastic, wood, concrete, *etc.*), at the desired thickness, in realistic conditions of evaporation, temperature and relative humidity, in a non intrusive and objective way.

The kinetics obtained from waterborne products always display a profile in 4 stages corresponding to the 4 stages described in the literature for latex film formation:

- Stage I: **evaporation**. Particles are free to move and the signal decreases as the concentration and viscosity increase.
- Stage II: **particle ordering or packing**. Particles start to interact and reorganise to form a close-packed array. The agitation observed on the Horus® kinetics is due to this reorganisation and chaotic phase.
- Stage III: **particle deformation**. The interstitial water leaves the coating and particles deform giving rise to a large increase of the viscosity of the coating, hence a large decrease in the signal.
- Stage IV: **interdiffusion**. When the system has the right properties (e.g. required T_g), the boundaries between the particles disappear, leading to a uniform film.



The Horus® gives a unique and complete information on the film formation steps, instantaneously, in objective and representative conditions.