The film formation of polymeric particles analyzed by optical reflectometry

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In the field of coatings, paints and inkjet printing, an aqueous dispersion of polymeric particles is transformed into a continuous material as thin layer with special properties and morphology. The primary stages of this process called latex film formation, have been studied in the last years and various methods based on small angle neutron scattering, scanning electron microscopy, atomic microscopy and optical spectroellipsometry have been developed. It has been experimentally found that the composition of the aqueous mixture (surfactants, solvents, and pigments), the type, structure and dimension of the latex particles as well as the ambient conditions have an important influence on the film formation and its dynamics. However, understanding the mechanisms by which all these factors affect the film formation process is still a challenging topic.

The aim of this work is to present a recently developed non-invasive technique based on optical reflectometry in visible range used to study the film formation from aqueous mixtures layered up to 25μm thickness. The sample holder is made of crystalline silicon and the generated fringes are vital to determine the sample thickness. For the polymeric colloids with minimum film formation temperature higher than the room temperature, the setup is used to determine the evaporation rate, the temperature film formation, the pigment color spectral distribution. The versatility of the experimental setup is increased by a controlled temperature of the sample holder and a controlled microclimate chamber (temperature and relative humidity). Investigations on various aqueous dispersions considering the composition, the viscosity of the liquid and different types of polymeric colloidal particles have been performed and the results are here discussed. New challenges lie in analyzing the outputs of the experiments considering the interparticle distance and interparticle interferences.