ABSTRACT

Presenting PhD thesis deals with understanding of the film formation process of coatings for metal corrosion protection as well it was looked at the role of fillers in the film formation process. Initially, the focus was on the waterborne epoxy - amino polymer system with an emphasis on studying the phenomenom of coalescence, physical drying and polyaddition of oxirane and amine groups. The film formation process in a epoxy-amino model system was followed by FT-IR spectroscopy, DLS, GPC chromatography and AFM microscopy. In the second part focus was on the influence of the molar ratio of both active functional groups (amino and epoxy) on the reaction speed and film formation process, as well as the resulting quality of corrosion protection and finally the rheological properties of the individual system. In the third part it was studied the process of film formation depending on the volume concentration of fillers (PVK) in water-dilutable epoxy coating films using electrochemical impedance spectroscopy (EIS) and dynamic mechanical analysis (DMA). In the fourth part was the aim of study influence of the dispersing polymer (PAS) on the stabilization of the filler in colloidal system. We were interested in the influence of PAS deficiency or excess on the quality of the anticorrosion properties of coating film. The CMC of the samples was determined by using surface tension and on the other hand corrosion properties (EIS) was studied.

It has been shown that impedance spectroscopy can serve as a very sensitive tool for precise experimental detection of critical pigment concentration. We also show that the optimal film formation process and corrosion stability of coatings are greatly affected by the coating pigment volume concentration (PVC) value and precise amount of disperse polymer. As a whole, the study confirms that the optimization of coating protection ability needs to take into account both maximization of the "barrier effect" and the maximization of the degree of epoxy-amino chemical crosslinking.

Key words: PVK, corrosion protection, film formation process, waterborne epoxy-amino coating.