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STUDY THE ROLE OF NANO-SIZED CACO3 ON THE CURE KINETIC OF POLYESTER/EPOXY HYBRID COATING

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Environmental regulations within the finishing industry have led to developing technologies that should meet the requirement of both the environmental compliance and high performance. Powder coatings, particularly polyester/epoxy hybrids proved their ability as environmentally sound alternative to the traditional solventborne coating inclding both the high performance and durability. Recently, the employment of nanoparticles such as nano-CaCO3 (nCaCO3) has been suggested as a beneficial strategy toward powder coating with improved properties. Accordingly, the effect of nCaCO3 on the morphology, cure behavior, adhesion and hardness of polyester/epoxy system has been deeply studied in the present endeavor. The nanoparticles shape, size and dispersion state were investigated through X-ray diffraction (XRD), transmission electron microscopy (TEM) and scanning electron microscopy (SEM) methods. Furthermore, isothermal cure characterization of the neat and filled systems was performed using a torque rheometer. The most important finding concerning the rheological studies was the catalytic effect of nCaCO3 on the cure reaction of polyester/epoxy causing shorter curing times. Moreover, the kinetic analysis of the rheogram indicated a marked decrease in the energy of the cure process upon raising the nCaCO3 content. Interestingly, pull-off adhesion and hardness tests revealed that the adhesion strength and hardness value were dramatically increased followed by the addition of nCaCO3 into the polyester/epoxy system compared to the pure hybrid resin. Therefore, considering the strong inexpensive nanofiller, it is necessary not only to reduce the dwell time which has benefits in terms of the energy and economic but also to improve the performance of final polyester/epoxy coating.