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DEVELOPMENT AND OPTIMIZATION OF WATER BASED PAINT FORMULA IN ORDER TO REDUCE VOCs EMISSIONS

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Abstract

The interest in waterborne paints amelioration increased lately due to the toxicological effect of certain ingredients on human health, the restrictive environmental legislation and the depletion and escalation in price of raw materials. Research efforts in formulating waterborne paints are directed to insure low volatile organic compounds (VOCs) emission while maintaining and even improving their properties.

This paper presents a waterborne paint formulation process. The required main ingredient was an alkydic resin with 51.3 % w/w non-volatile-matter content, 51.6 mg KOH/g acidity, 8.5 pH, 80 s flow time. Aiming the highest values for paint viscosity, elasticity and hardness and the lowest VOCs emission, the optimal composition concerning the resin neutralization, type and amounts of neutralization agents, co-solvents and water were determined by Response Surface Methodology (RSM). As consequence, the resin was neutralized with a mixture of ammonia and triethylamine in 1:1.8 ratio and solubilized with butanol and butyl glycol co-solvents (2.8:1 ratio). Pigments and filling material were used in a 2.6:1 ratio reported at resin content. The final product can be described as a homogenous, viscos fluid, with 152 s flow time and 22.5% VOCs content. In the optimized drying conditions, it formed a film with a fineness of 40 μm , a semi-gloss aspect, a good adherence, an elasticity (after 7 days) of 5.5 mm and a hardness of 45, 93 and 104 s (after 24 h, 3 and 7 days respectively).

Key words: alkyd resin, enamel, mathematical optimization, primer, waterborne paint

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