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The effect of the hardener on the characteristics of the polyester-based coating

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INTRODUCTION & AIM

Coatings based on polyester resins are a sought-after material and, when cured, have high hardness, wear resistance, and no toxic emissions during operation.

The variety of composition and structure of saturated polyester resins contributes to the use of a wide range of materials in production. Monomers for polyesters can be obtained from renewable raw materials, which is promising as sustainable materials.

As a result of combining polyester resins with blocked polyisocyanate resins, epoxy and siloxane resins, materials with excellent properties can be obtained.

METHOD

Sebacic acid polyester with ethylene glycol and glycerin was used to produce polymer films (Figure 1). Polyester is a paraffin-like mass of light gray color. The main characteristics of polyester: the acid number (mg KOH per 1 g of polyester) is 10, the mass fraction of hydroxyl groups (%) is 7.

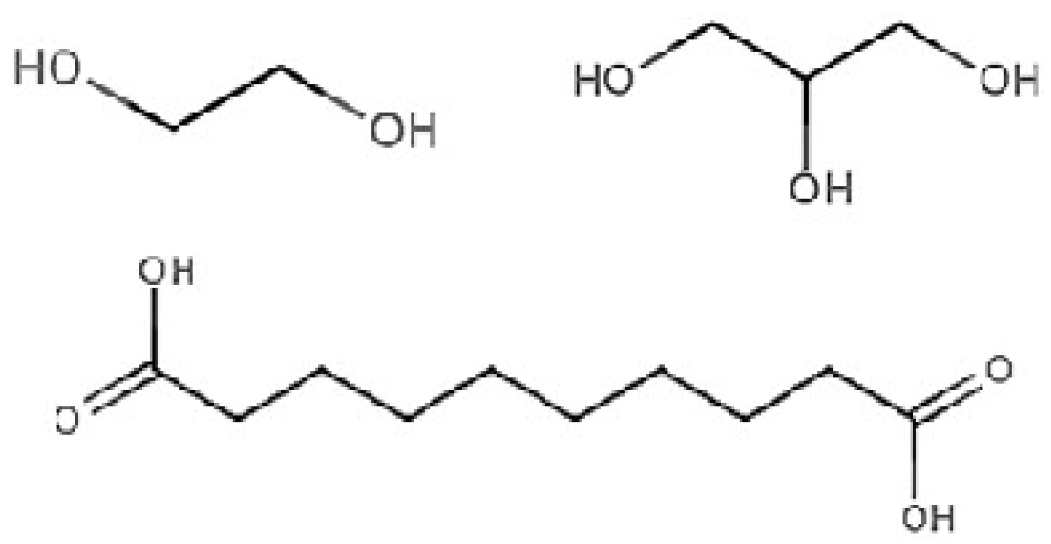


Figure 1. The initial components for the production of polyester

To develop a formulation for a cold-cured polymer coating, compositions based on the obtained polyester (PE) and epoxyamine resins (EAR, Fig. 2) were composed. A polyamide hardener was tested as a hardener – a product of the interaction of polymerized fatty acids of vegetable oils and polyethylene polyamines (PAH, Fig.3).

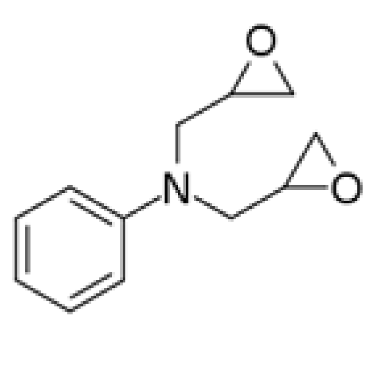


Figure 2. EAR

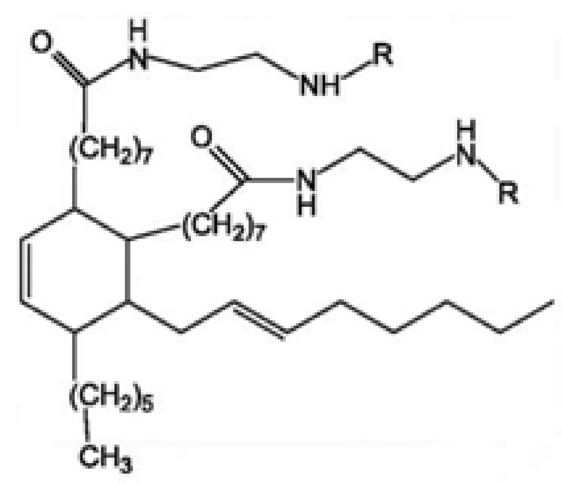


Figure 3. PAH

RESULTS & DISCUSSION

The components of the formulation were mixed in the ratio PE : EAR : PAH = 2 : 3 : 4. After 24 hours, the film was presented with burgundy glossy polymer. The IR spectrum of the product is shown in Figure 4.

The degree of curing was analyzed: The amount of gel fraction was 93%. Physico-mechanical characteristics of the polymer: E = 2.56 MPa, σ = 0.43, tensile strain – 38%, elongation at maximum load – 21.77 mm, Fmax = 6.9 H.

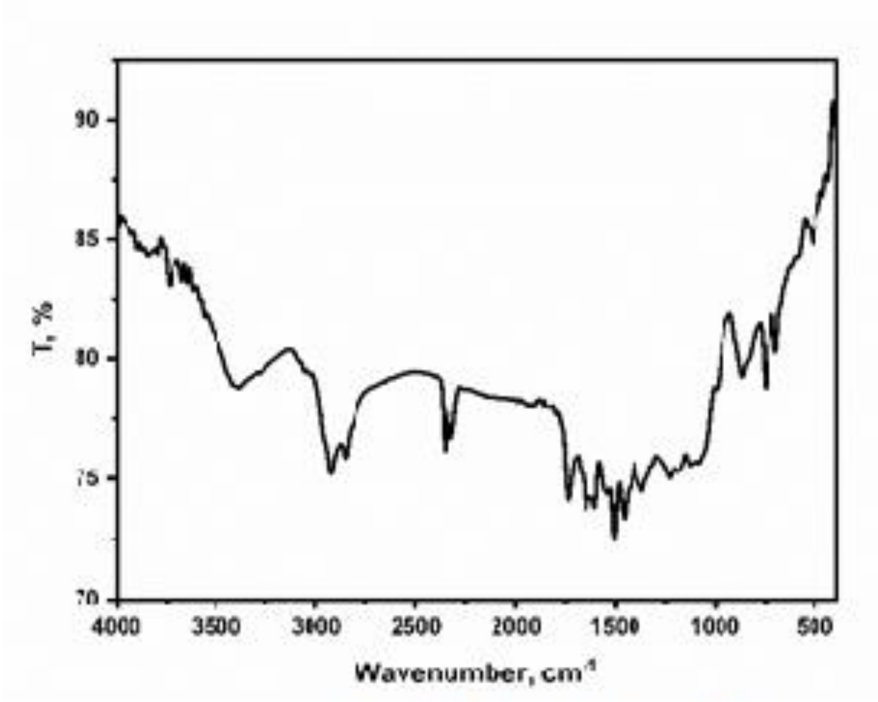


Figure 4. IR spectrum of the product

Adhesion test – 10 PM with a coating thickness of 2.2 mm. Dielectric continuity before impact tests – no defects were found. Impact strength at a maximum height of 500 mm – without defects. Dielectric continuity after impact test – no defects were found.

The marginal angle of wetting with water was 79° (Figure 5), the experiment with benzene did not allow us to determine the angle, and droplet spreading was observed.

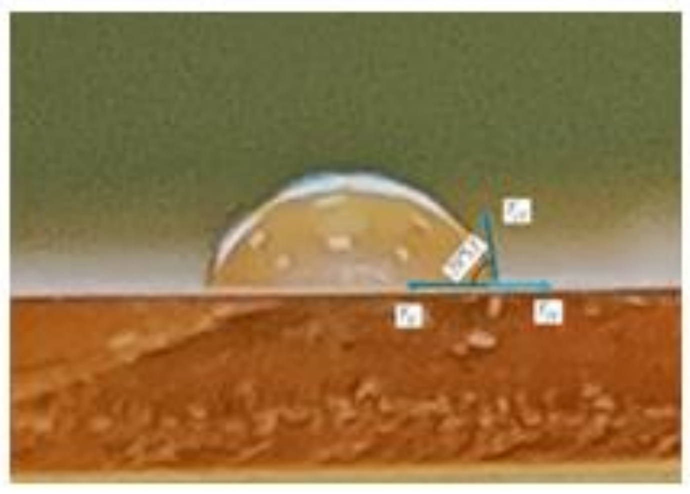
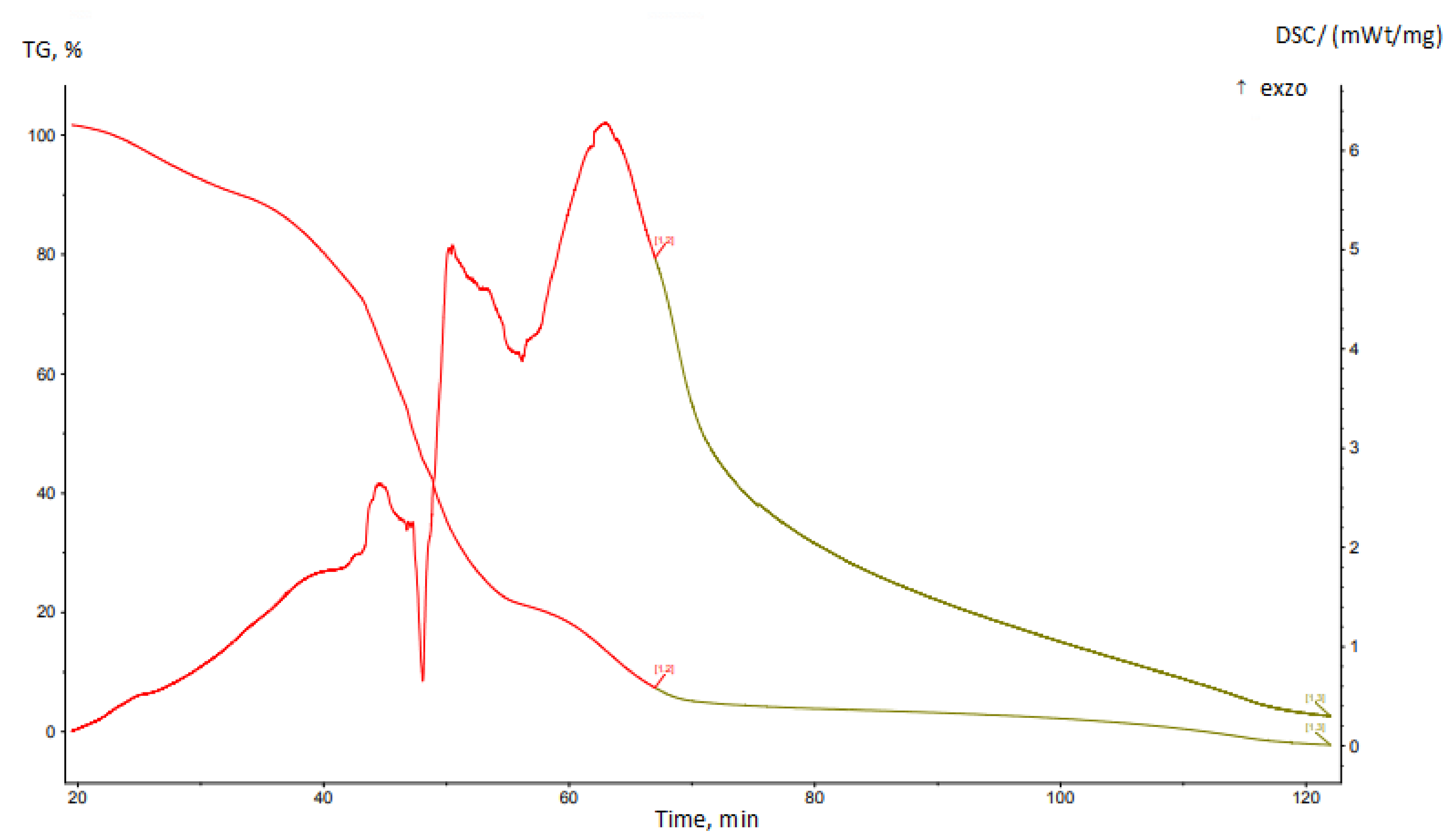


Figure 5. The edge angle of wetting with water

The thermal stability of the obtained copolymer was studied when heated in an air atmosphere up to 600 °C (Figure 6).



CONCLUSION

The thermogram of the sample shows a gradual gradual decrease in mass, which is probably due to the further curing process. Therefore, in order to ensure high performance, it is necessary to refine the coating formulation and curing mode.