AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 02, Issue 03, 2024 ISSN (E): 2993-2149

SYNTHESIS AND RESEARCH OF PHTHALOCYANINE PIGMENTS CONTAINING COBALT-CALCIUM PRESERVATION

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Abstract: An alkyd paint synthesized in a product containing cobalt, nitrogen, phosphorus and a new diamidophosphate-cobalt-phthalocyanine (DAPCoPc) pigment was analyzed by thermal analysis. The heat resistance of synthesized alkyd paint with pigment addition was compared with the heat resistance of imported alkyd paint with pigment addition.

Key words: phthalocyanine pigment, thermal analysis, alkyd paint, exothermic, endothermic, cobalt diamidophosphate, phthalic anhydride, intensity.

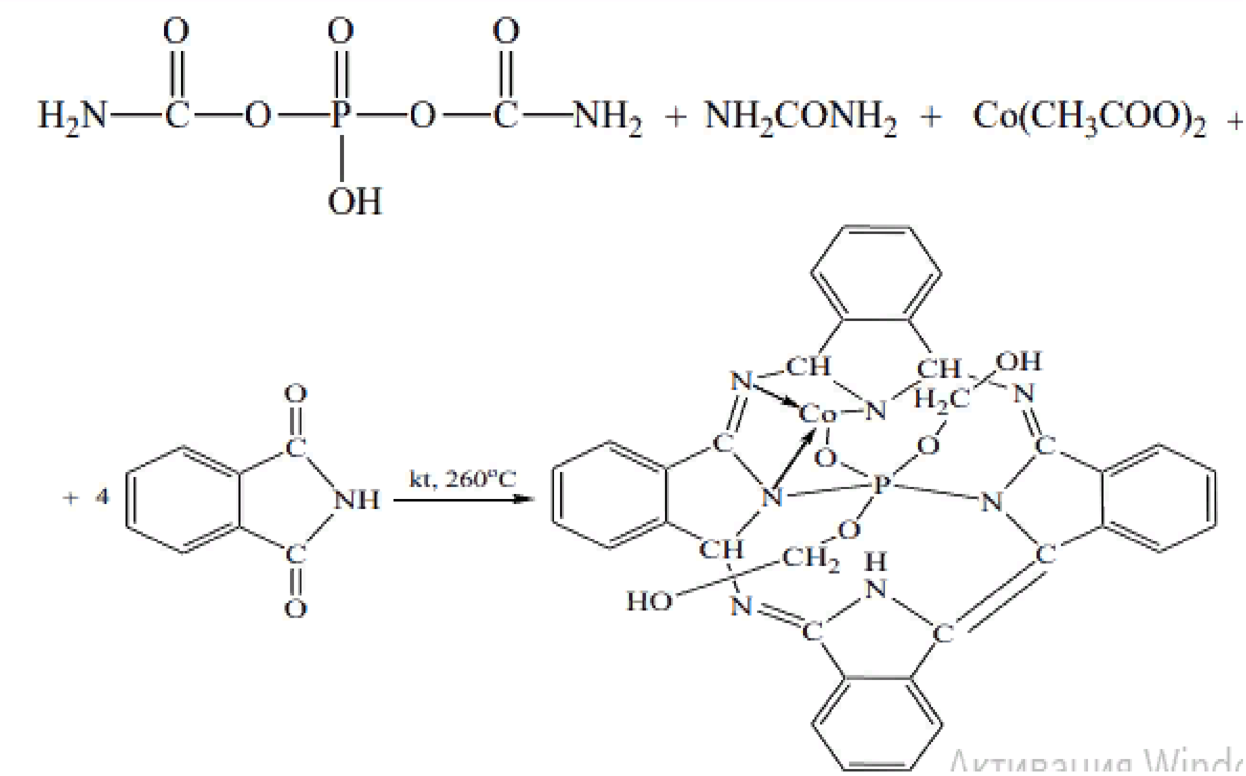
Enter. The volume of construction works in the world is growing rapidly. This, in turn, leads to a sharp increase in the demand for lacquer products. The main component of paints and varnishes are film-forming polymers produced in paint and varnish factories. The use of such synthetic film-forming polymers made it possible to expand the raw material base of the varnish industry, new modern varnish materials were created. About 25% of the volume of organic pigments produced are phthalocyanine pigments. From this point of view, phthalocyanines with nitrogen and phosphorus storage groups are of special scientific and practical interest. In this case, it is possible to obtain paint coatings obtained in the presence of phthalocyanine pigments. A compound called phthalocyanine was first obtained from the industrial production of ortho-disubstituted benzene derivatives. In 1907, Brown and Cherniak reported the synthesis of 2-cyanobenzamide to form a thick, insoluble complex product [1]. In 1927, a stable blue compound was formed as a result of the reaction of 1,2-dibromobenzene with copper cyanide in boiling pyridine [2]. Linstead was the first to prove the structure of phthalocyanine and also synthesized some metal complexes of phthalocyanine [3-8].

Research methods and objects. Synthesis of cobalt phthalocyanine (DAPCoPc) based on diamidophosphate. The synthesis was carried out in two ways: in a solvent environment and heating at high temperature.

73.6 g (0.4 mol) of diamidophosphate, 24 g (0.4 mol) of urea, 235.6 g (1.6 mol) phthalimide, 70. 8 g (0.4 mol) cobalt acetate (catalyst II in the form of ammonium heptamolybdate in the form of phthalimide and 1% by weight of the solvent and 550 ml of dimethyl sulfoxide (DMSO). The reaction is carried out for 3-4 hours , stirred at this temperature. When the reaction is complete, it is cooled and filtered in a Buchner funnel, and the dark turquoise pigment remaining in the funnel is washed again with distilled water. The washed product is dried in an oven at 50 °C. , the yield is 93%.

Synthesis by heating at high temperatures. In a special 500 ml vessel made of high-temperature acid-resistant nerve, mix 9.8 g (0.1 mol) of orthophosphoric acid with 18 g (0.3 mol) of urea using a glass rod until completely dissolved at 130 ° C, and 7 g (0) add. .04 mol) cobalt (II) acetate, 6 g (0.10 mol) urea, 24 g (0.17 mol) phthalimide, ammonium heptamolybdate as a catalyst in the amount of 1% by weight of phthalimide, homogeneous (red color) Mix until smooth.). The reaction mixture was heated in an oven at 260°C for 3 hours. The resulting powdery reaction mixture was then cooled to 50°C and heated to 40°C for 20 minutes with the addition of 85% sulfuric acid. Add boiling water to the dissolved product and mix. 1M $NaHCO_3$ solution is added to neutralize unreacted soluble primary and intermediate products. DAFCoPc pigment precipitates. The precipitated phthalocyanine pigment is filtered in a Buchner funnel and the product is dried in an oven at 50°C. The dry mass is purified from impurities in ethyl alcohol and re-purified in distilled water in a Buchner funnel. The yield of the obtained product is 80%.

Preparation of new diamidophosphate-based cobalt phthalocyanine pigment (DAFCoPc) was carried out in a solvent environment, and its intensity when heating the composite mass, discoloration effect of acrylic-based paints, and some physicochemical properties were studied. According to the obtained results, the second method of pigment production was chosen for the synthesis of dry mass at high temperature. The yield of this method is lower than the first method, but its intensity, brightness and active effect are at high temperature. 4.5% is added to acrylic-based lacquer materials. The degree of color change differs from the pigment obtained in the solvent medium, forming a bright turquoise paint. The formula of the resulting substance is based on elemental analysis and IR spectral analysis:



Using this formulation, we studied the variation of yield depending on the temperature at which the DAFPoPc pigment was obtained.

Results and discussion. Temperature plays an important role in the highly intensive, active properties of the pigment, and at the same time, if the high temperature exceeds the norm, the yield of the resulting product will decrease to a certain extent.

The pigment was synthesized at 190, 230 and 260 °C. In the process of intensive synthesis of the active pigment, this temperature was chosen without raising the temperature to 260 ° C, after 2 hours the reaction yield reached a maximum of 93%, and after 3 hours the yield decreased to 80%. The difference between the two products is that 80% of the pigment produced in the product showed a higher intensity after adding acrylic-based paints.

Thermal analysis - The thermal stability of the synthesized nitrogen- and phosphorus-containing phthalocyanine pigments was analyzed by differential thermal and thermogravimetric methods in a French LABSYS EVO STA device. LABSYS evo STA (Simultaneous Thermal Analysis) TGA and TGA-DTA, TGA-DSC analysis methods is an easy-to-use, reliable and high-performance thermal analysis platform. The derivativeogram was checked at a speed of galvanometer sensitivity of 10 deg/min, T-900, TG-200, DTA - 1/10, DTG - 1/10, automatically recorded on photographic paper. A sample of the studied pigments weighing 35-46 mg was placed in a crucible without a cover, made of aluminum oxide and platinum resistant to 1650 ° C, with a diameter of 10 mm.

The results of thermal analysis of alkyd enamel with addition of newly synthesized DAFCoPc pigment were studied on the basis of presented derivatogram images. Five endothermic reactions at 20, 30, 200, 220, 260 °C and five exothermic reactions at 50, 280, 300, 325, 500 °C were observed. Based on these values, the analysis results in the thermal analysis of alkyd enamel with the addition of DAFCoPc pigment were presented. In alkyd enamel prepared with the addition of DAFCoPc pigment, 60 mg of enamel was measured in the system and the temperature was increased from 20 °C.

The thermal analysis of paints containing cobalt phthalocyanine pigments containing nitrogen and phosphorus and chromatic pigments of copper phthalocyanine pigments was studied, as a result, alkyd enamel paints based on synthesized phthalocyanine pigments showed a partial decrease in weight by 3 °C showed a gradual decrease at higher temperatures.

Summary. Finally, the thermal analysis of alkyd paint with complex pigment paint containing nitrogen, phosphorus, cobalt and phthalate group was studied. A comparison of heat resistance of alkyd enamel paints with 4.5% DAFCoPc pigment and imported CuPu pigments based on copper phthalocyanine was made. The complex arrangement of organic groups in the DAFCoPc pigment plays an important role in increasing the intensity of the pigment. The newly synthesized pigment is synthesized in a new and unique way, which makes it possible to achieve high economic efficiency in the process of pigment synthesis and reduce foreign exchange expenditure.

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