

INCREASING THE STABILITY OF POLYVINYL CHLORIDE UNDER THE INFLUENCE OF SOME HETEROCYCLIC SALTS.

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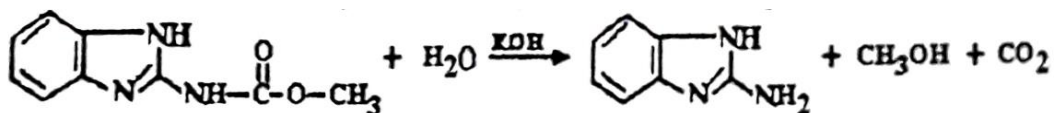
Annotation: *In this study, given that quality is the first priority in the development of polyvinyl chloride (PVC) products, which are increasingly displacing metal products from the consumer market, extending the useful life of polymer products can solve many of the consumer's economic problems.*

Keywords: *Polyvinyl chloride (PVC), calcium stearate, lead silicate, benzimidazole sodium salt, tin salt of benzimidazole, tin salt of 2-aminobenzimidazole, cobalt salt of 2-aminobenzimidazole*

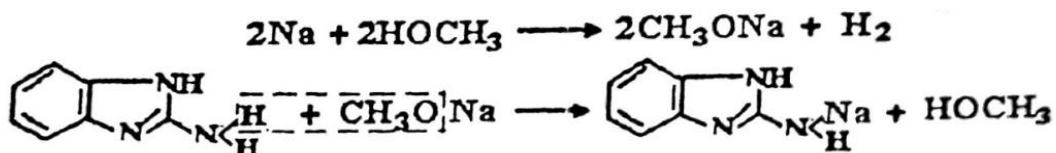
Relevance. Taking into account that quality is the first indicator in the development of polyvinyl chloride (PVC) products, which are displacing metal products from the consumer market every day, extending the service life of polymer products can provide an opportunity to solve many economic issues of the consumer [1,2]. Based on the information in the literature, the presence of heteroatom nitrogen in the aromatic ring of 2-aminobenzimidazole (AB), based on its structure and properties, it is possible to predict that the substance has thermal stability and antioxidant capacity [3].

The main objective of this research work is to stabilize PVC in the presence of heterocyclic compounds with multidirectional functional group and to produce an efficient, harmless, and harmless AB derivatives with industrially added stabilizers. study of the synergistic nature of mixtures in terms of one or more operational indicators and stabilization compounds containing lead metal used in the production of PVC-based artificial leather, linoleum and various household utensils replacement.

PVC (S-7059-M, $\eta=129000$, $\rho=1.38 \cdot 10^{-4} \text{mol/kg PVC}$, $d=0.45-0.55 \text{g/cm}^3$) was immersed in ethanol three times from its solution in tetrahydrofuran, and then "It was purified by extraction with ethyl alcohol in the Soxhlet apparatus. AB was obtained by hydrolysis of 2-methylcarbomatebenzimidazole using a 10% solution of KOH as follows:



The purity of the substance was checked on silofol plates, $R_f = 0.58$ if the eluent was benzene:acetone (1:1). To synthesize the sodium salt of AB (Na-AB), methanol, sodium metal and AB were dissolved in a reflux flask and the reaction was carried out using a water bath:



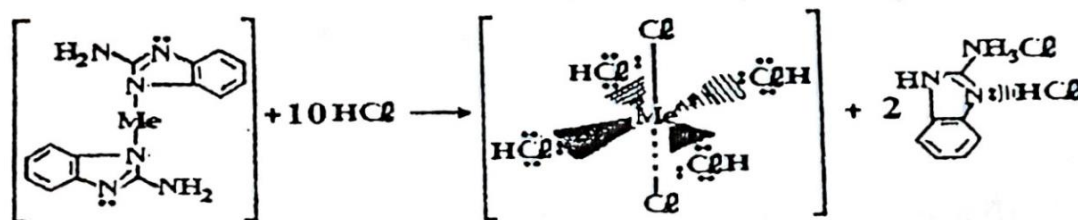
Table

The effect of nitrogen-containing heterocyclic compounds (0.1 mol/kg PVC) on the thermal stability of PVC in isothermal ($T = 448 \text{ K}$) and dynamic conditions

Name of the compound	Thermal stability period, 10^2s	Decomposition temperature, K		E kJ/mol
		beginning	maximum	
PVC free	15	463	523	108
Calcium stearate	17	473	530	120
Lead silicate	3,0	-	-	117
Benzimidazole sodium salt	18	-	-	-
Tin salt of benzimidazole	24	500	528	125
Tin salt of 2-aminobenzimidazole	39	483	540	127
Cobalt salt of 2-aminobenzimidazole	60	498	540	147

Results and its discussion: A white, very hygroscopic crystalline substance was dried over P_2O_5 in a vacuum cabinet. To obtain other salts of AB, Na-AB solution in absolute methanol was treated with chlorides of the desired metals. The formed salts were easily washed off with water because they are poorly soluble in water. Thermostability of PVC was determined by changing the color of Congo red paper indicator. Studies of the kinetics of dehydrochlorination of PVC were carried out using an alcohol solution of an indicator (a mixture of metal red and bromcresol blue) in an oxygen flow at a speed of $\theta = 0.12 \text{ l/min}$. Studying the effect of the compounds taken for research on the thermal stability of PVC in isothermal and dynamic conditions shows that the period of thermal stability depends on the metal that formed the salt, the group in its composition (table). Stabilization activity is high in cobalt salts, increasing the period of thermal stability by 4 (20) times compared to the composition (pure PVC) with the addition of industrial stabilizer calcium stearate. A clear slowdown in the weight loss of PVC samples undergoing thermooxidation and destruction in non-

isothermal conditions was observed in the presence of 2-AB salts. It can be concluded that the introduction of the NN2 group into the 2nd state of the heterocycle leads to a partial increase of this indicator, which is related to the fact that it has a relatively greater ability to bind HCl released from the PVC macromolecule, or [4,5]:



It is known that it is possible to obtain a good synergistic effect from mixtures of stabilizers used in industry with benzimidazole (BI) derivatives, which can be exchanged for an HCl atom and a labile chlorine atom. Based on this conclusion, the influence of mixtures of various compositions consisting of salts synthesized with calcium stearate and lead silicate on the thermal decomposition of PVC was studied. Measurements of the values of the thermal stability period of polymer samples show that calcium stearate and salts of BI and 2-AB give a synergistic effect.

Conclusions: The effect of salts as a stabilizing agent can be explained as follows:

- its effect disappears when the labile chlorine atom of the irregularly formed carbonylallyl groups in the chain is replaced by a stabilizing group;
- heteroatom nitrogen absorbs HCl by forming a donor-acceptor bond;
- It is also observed that metals form coordination compounds with HCl in salts of d-metals.

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