

POLYURETHANE COMPOSITIONS IN RUBBER FLOOR COVERING

DEMYANOVA V. S¹, GRINTSOVA O. V², GUSEV A. D³ & DENISOVA N. A⁴

¹Professor, HOD, FSBEU HPE "Penza State University of Architecture and Constructions"
"Engineering Ecology" Penza, Russia

²FSBEU HPE "Penza State University of Architecture and Constructions", Dozent, Penza, Russia

³Senior Lecturer, FSBEU HPE "Penza State University of Architecture and Constructions" Penza, Russia

⁴Penza State University of Architecture and Construction, Penza, Russia

ABSTRACT

The authors consider the influence of polyurethane composites produced by domestic and foreign manufacturers on the physic-mechanical and operational characteristics of coatings with the use of rubber crumb obtained by elastically deformed way of tire waste recycling.

KEYWORDS: Polyurethane, Adhesive, Rubber Crumb, Strength, Adhesion, Frost Resistance, Elasticity

INTRODUCTION

Polyurethane adhesives have appeared on the market of Russia not long ago. Having high technological characteristics (elasticity, a variable speed range of curing, a wide temperature range operation) it has found its application in industry [1.2].

Thanks to good adhesion with all kinds of rubbers, close chemical composition, polyurethane binder is one of the main ingredients in manufacturing of coatings with rubber crumb and in rubber products (rubber tiles, mats, seamless monolithic coating, etc.). The quality of the product depends on the properties of the used polyurethane binder, the time of polymerization, elasticity, odor, resistance to corrosive factors and others [3].

The study of polyurethane binders has showed that not all of them are hot-cured elastomers. Only in reaction with amines they acquire the properties of polyurethanes elastomers, have a high degree of safety because they do not contain toluene diisocyanate (ТДИ) [4, 5].

In this work we have used rubber crump (RC) as a filler in manufacturing floor coverings, its density is 1130 kg/m³ which is got by mechanical processing method and it preserves molecular structure in its basis and elastomeric properties [5]. The size of the used crumbs does not exceed 3mm., as for vulcanization it refers to soft (1-3 % of sulfur). Rubber crumb is non-toxic material and according to classification of hazardous substances according to GOST R 54096 refers to the 4th class of danger [4].

Polyurethane binders of home producers "И-01 Standard", ООО "Universum" Tver, "Orion-SV", LLC "Technology coatings" Vladimir and foreign producers A-3 21 (Turkey) were used as joiners. For comparison binder "ИУ СТЛ, mark 2" binder used e "ИУ СТЛ, mark 2" developed by ООО "STL", Penza was used. The tests have showed that binders "P-02" Standard "and "Orion-SV" have a pungent smell, which is a negative factor at production tiles for indoors. In this regard, these binders were not considered in the further studies.

Manufacturing of tile products was carried out by cold pressing. This technology allows to produce high quality products with required quality of elasticity ensuring complete polymerization of the binder due to the interaction of the polymer with the moisture contained in the crump. For manufacture of 1 m² of tiles they have used the following formular: crumb rubber fr. 1-3 mm.-26, 0 kg, polyurethane binder-2, 8 to kg, pigment (titanium dioxide)-0.4 kg. The results of tile tests with the use of different kinds of binders are shown in Table 2

Table 2: Performance Characteristics of Coating

Number	Name of Binder	Tile Characteristics					
		Density kg/m ³	Strength, MPa	Attrition, g/cm ²	Water Absorption, %	Frost Resistance, the Cycle c.	Timepolymerization (t _n / t _k), h
1	"II-01 Standard"	781.2	0.65	0.05	8.4	more than 300	6/144
2	«RapidES »	814.2	0.79	0.04	7.9	more than 300	4/120
3	"IIY CTJI"	807.1	0.78	0.04	8.1	more than 300	4/148
4	A-321	812.3	0, 84	0.03	7.9	more than 300	4/100

The testing results of adhesive compositions by different manufacturers revealed that at 80 ° C the time of polymerization of samples number 1 exceeds 6 hours. It is not acceptable for the required time is no more than 4 hours. Raising the temperature from 80. 100 ° C to 120 ° the speed of polymerization increases. But this leads to a decrease in strength and performance. The observed decrease in strength and elongation of flooring samples at high temperatures, probably happens due to the destructive processes in elastic filler - rubber crumb.

Increasing the pressing temperature is accompanied by a significant increase of energy expenditure, and at a constant temperature the productivity is decreased by 30- 40%. In turn formulas with the use of IIY "Rapid ES" and "IIY CTJI, mark 2" as a joiner showed identical physical and mechanical performance.

The difference is in flexibility and elasticity of coatings. Application of IIY «Rapid ES » allows to get a more rigid coating (In excess of 10-15%) due to higher level of adhesive brittleness. Formula number 1 also has high mechanical characteristics. But as for polymerization durability it yields formula number 4. In such coatings we can observe peeling of the colored zone.

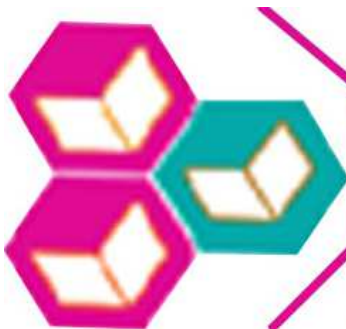
This indicates poor adhesion strength (in the presence of finely dispersed pigments) of the binder with rubber crumb. The highest characteristics were showed by adhesive of Turkish origin A-321. The coating with characteristics of adhesive A-321 exceeds on 8-12% the other samples. The cost of polyurethane binder A-321 is 175 rbl / kg., while the cost of the other binders is about 140.0 rbl / kg.

Thus, the most effective binder from technical and economic point, are adhesives "IIY CTJI, and mark 2", which have greater elastic properties but demande more time to complete polymerization and adhesive IIY «Rapid ES ».

REFERENCES

1. Sidorov O.I., Poisova T.P., Merkulov V.M. Soluable polyurethane adhesives. // Adhesives. Sealants. Technology. 2006. Number 9. Pp. 13-19.
2. Demyanova V. Gusev, AD, GN Simakina Main directions of tile market in the construction industry of the Penza region // Regional Architecture and Construction, Penza, -2012. - № 1 (12) p.193-196
3. Demyanova VS, Gusev AD P respects of Automobile Recycling tire// Scientific Herald of the Voronezh State University of Architecture and Civil Engineering. Construction and Architecture. 2012. Number 4. C 28-35.

4. Demyanova VS, Gusev AI. D. Efficient construction materials using technological waste. Penza, 2013, 128
5. Gul VE The structure and strength of the polymers. /VE Gul// 3rd ed. In e servant. and add. Khimiya. 1978. 328.



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