Величина резонансной частоты может быть связана с размерами капилляров и пор внутри другой твердой или жидкой фазы.

ЛИТЕРАТУРА

1. Ведерников, Д.Н. Исследование процесса гидролиза растительного сырья в регулирующем поле слабых тензоимпульсов / Д.Н. Ведерников, В.И. Рощин, В.И. Зарембо, А.А. Колесников // Известия СПГТИ (технического университета). – 2010. – Т.35. – №9. – С. 15–17.
2. Zarembo, V.I. Background resonant acoustic control of heterophase processes / V. I. Zarembo, A. A. Kolesnikov //Theoretical Foundations of Chemical Engineering. – 2006. – Vol. 40(5). Pp 483–495.
3. Захарова А.С. Амплитудные и фазовые флуктуации в детерминированных генераторах хаоса и зашумленных автоколебательных системах: автореф. дисс…. канд. физ.-мат. наук. Саратов, 2010. – 23 с.

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POLYMERIC COMPOSITES CONTAINING WASTE PRODUCTS OF MEDICINAL PLANT YUCCA

with polymer composition materials (composites) [1]. At last years the polymers with wood high dispersive materials attract more and more attention of the scientists and engineers [2-4]. The widening of production of such materials is due to the gradual decreasing of the natural purveyance and cheapness of the wood wastes. Besides of the composites with wood wastes are characterized with high technical characteristics and often are even better than the analogues made from poor woods.

The purpose of our work is the obtaining of ecologically poor polymer composites filled with natural plant wastes, namely –yucca.

***Experimental*:** In our case we used the ***Introduction*:** The development of the modern building industry, agriculture and other industrial branches are hardly connected yucca – subtropical plants dry wastes dispersive fibers (<50 mcm), which have very thin needles face. Using of yucca wastes in composites is based on application namely of needle like structure of this plant [5]. The epoxy resin ED-20 with hardener polyethylene-polyamine as hardener are used in our composites. There were obtained the composites with different content of ingredients. The moulds used in our technology for formation of samples for physical-mechanical and other properties were selected in accordance with standards using fluoroplastic material. At the end of hardening (after 24 h) the samples were removed from moulds and are heat-treated in the thermostats during 2 h under 80^0 C.

***Results and discussion*: **The following characteristics of the obtained composites were testified: density, mechanical strengthening at pressing, softening temperature by Vica method and water-absorption. Obtained results are presented in the Table 1and Table 2.

Table 1

N	Filler (wt%)	Density, g/cm^3	Strengthening at pressing, MPa	Softening temperature, C^0	Water-absorption, %
1	40	0,94	66,2	185	1,5
2	50	0,87	60,6	170	0,16
3	70	0,82	54,8	160	2,5

Table 2 – The technical characteristics of the composites based on epoxy resin and yukka dry wastes (average length of the filler particles is < 50 mcm)

N	Filler (wt%)	Density, g/cm^3	Strengthening at pressing, MPa	Softening temperature, C^0	Water-absorption, %
1	40	0,90	58,7	180	2,07
2	50	0,99	63,9	170	3,17
3	70	0,89	51,4	170	5,48

Tables 1 and 2 data show that first of all the composites containing 40-50 wt% of the filler with middle sizes about 50 mcm are characterized with more high characteristics in comparison with analogues with more high dispersive fillers. This result may be ascribed to present of more long needles in first composites, than in second one. On the second stage we have preliminary modified the filler particles by 5wt% of ethyl-silicate using the reaction of sylanization. The end product of this reaction was investigated by use of FTIR. Obtained by this way modified filler was introduced to the epoxy resin, which was hardened in the regime described above. The technical characteristics of the composites with modified fillers are presented in the table 3.

Table 3 – The technical characteristics of the composites based on epoxy resin and yukka dry wastes modified by ethyl-silicate

N	Filler (wt%)	Density, g/cm^3	Strengthening at pressing, MPa	Softening temperature, C^0	Water-absorption, %
1	40	1,10	77,6	180	1,80
2	50	0,98	79,3	190	2,56
3	70	1,80	76,9	170	3,90

In accordance with the table 3 data the strengthening of the composites containing the modified filler is rather high than for analogues containing unmodified same filler. This parameter depends on the content of the filler. By more high values of strengthening are characterized the composites containing 40-50wt% of the modified filler. These composites are characterized with high softening temperature (i.e. high thermal stability). It is clear that improving of technical characteristics of composites with modified fillers is due to molecules of ethyl-silicate, which are displaced on the surface of needle like Yucca fillers and active influenced on the hardening reactions in the composites in result of which the interactions reactions between filler particles and epoxy-molecules enhance and the compatibility of composite components increases. Namely the last fact is responsible in the increasing of waterproofing of the composites. It is well known fact that after increasing of the dispersive filler concentration the water absorption of polymer composites enhances. The experimental data show that because of the modifier action the increasing of the water-absorption in composites at increasing of the filler concentration is slower than in case of analogues without unmodified filler.

Conclusions**:** Application of dry wastes of the plant yukka as fillers in the composites based on epoxy resin leads in general to obtaining of material with high light weight, low water absorption and good mechanical and thermostable properties. For example, the composites containing 40–50wt% of yukka are characterized with following parameters: strengthening (at pressure)-60-66MPa, thermal stability 170–185^{0}C, water-absorption 0.16–1.5%. Introduction to the composites of the same filler particles modified by ethyl-silicate improves some properties of the composites in comparison with analogous containing the same, but unmodified filler to some extent (especially strengthening- up to 77 MPa). Improving of the technical characteristics of composites containing modified by ethyl-silicate filler in comparison with analogous materials with unmodified one is due to enhancing of the ingredients compatibility and increasing of interaction between them.

REFERENCES

1. J.Aneli, O.Mukbaniani, E.Markarashvili, G.Zaikov, E.Klodzinska. Chemistry and Chemical Technology, 7 (2), 141-145, 2013.

2. Wood-Polymer composites. Ed.by K.O.Niska and M.Sain. Tokio, Japan, 2012.

3. A.Klesov, Wood –plastic composites. J.Wiley & sons, 2007, 698 p.

4. Clemons, C.D. Wood-plastic composites in USA, Forest product Journal, 2002, 52 (6).
5. J.Aneli, L.Shamanauri, J. Aneli (junior). Polymer conmposite. Georgian Patent. P6127, 2014. Tbilisi, Georgia.

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БИОЛОГИЧЕСКИ АКТИВНЫЕ СОЕДИНЕНИЯ ФЕНОЛЬНОЙ ПРИРОДЫ ЭКСТРАКТОВ КОРЫ ОЛЬХИ

В Республике Беларусь, ольха издавна применялась и применяется в настоящее время для производства фанеры. Ещё до Великой Отечественной войны все фанерные заводы в БССР работали преимущественно на ольхе. Известно, что сразу после революции и окончания гражданской войны, когда страна ещё находилась в состоянии разрухи, начались поставки фанеры на экспорт. Так в 1921-1922 операционном году на экспорт было поставлено 4038 м^3 фанеры, а в 1925-1926 году было экспортировано почти 10 тыс. м^3 фанеры. И из них почти 50% приходилось на ольховую фанеру. Ольховая фанера по выделке, сортировке и качеству предпочитается во многих случаях берёзовой фанере. Основной страной-получателем была Англия [1].

В лесном фонде Беларуси черноольховые леса занимают 694,5 тыс. га, что составляет 8,6% от лесопокрытой площади. В силу того, что древесина ольхи черной является ценным сырьем для выработки фанеры, древостои этой породы интенсивно вырубаются, начиная со второй половины XIX века [2]. В результате на предприятиях деревообрабатывающей промышленности скапливается кора ольхи в виде отходов, количество которых достигает 15% от перерабатываемой древесины. Как известно, основная масса древесной коры сжигается или вывозится в отвалы, хотя, как показывают исследования, такая утилизация крайне нерентабельна, так как высокая влажность отходов обуславливает низкую теплоту сгорания. Кроме того, образующиеся продукты сгорания и несгоревшие частицы оказывают негативное влияние на окружающую среду [3].

В тоже время, очевидно, что по своему химическому составу кора является уникальным возобновляемым сырьем для получения многих востребованных натуральных продуктов. В коре, наряду с полисахаридами и лигнином, находятся флавоноиды, красящие, пекти-