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December 1-3, 2016 - İstanbul, Turkey

International Center of Sustainability (ICS) is a research and academic center for sustainability founded in 2015 and housed within the Marmara University in Istanbul. ICS is dedicated to build resilience of communities and ecosystems to environmental and socio-economic risks. ICS has an integrated approach and defines sustainability not only in terms of environment but also in terms of socio-economic process. The ICS supports efforts to create an active culture of sustainability and it is committed to developing and maintaining healthy living environments and communities while fully integrating sustainable practices at home and abroad.

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Thursday, December 1st

13:00-15:00 Room: Çengelköy

Session 103: Human Development and Sustainability
Chair: Dr. Murat Onuk

The Analysis of Human Development Index with Multivariate Data Analysis Techniques
Dilek Altaş, Gülen Arıkan

Designing Sustainable Human Settlements
Murat Onuk

Effect of Human Resources Applications on Sustainable Performance: A Survey of Technopark Companies
Ayşe Demirhan, Serdar Bozkurt, Burcu Yiğit, Mehmet Çağlar

Virtual Presentation

Behavioral Competencies of Sustainability Leaders - An Empirical Investigation
Beth Knight, Fred Paterson

Poster Presentation

A Comparison of Human Development Index and Health Indicies' of the Countries with Cluster Analysis
Dilek Altaş, Gülen Arıkan

Is Mass Tourism Sustainable? The Case of Turkey
Selahattin Güriş, Ebru Çağlayan Akay, Filiz Çakır Zeytinoğlu, İrem Saçaklı Saçıldı, Cüneyt Sadıç

13:00-15:00 Room: Beylerbeyi

Session 104: Sustainable Natural Resource Management
Chair: Prof. Zehra Semra Can

Environmental Remediation Cost of Industrial Solid Waste in Terms of Extended Exergy
Candeniz Seçkin

Removal of PB (II) Ion from Aqueous Solution by Adsorption Process onto Paper Mill Sludge: Isotherm and Kinetics
Ali Yaraş, Hasan Arslanoğlu

Vermicomposting System for a Sustainable Waste Management at Marmara University
Recep Önder Sürmeli

Environmental and Economic Analysis of a Rainwater Harvesting System at Marmara University
Recep Önder Sürmeli

Poster Presentation

A Transport and Kinetic Study of Acetic Acid Removal through Bulk Liquid Membranes Containing 1-Butyl-3-
Nilay Baylan, Süheyla Çehreli

Production of Polyester Composite Material Using Pine Cone Powder as Reinforcement
Duygu Gökdai, Alev Akpınar Borazan

Thursday, December 1st

15.00-15.15

Coffee Break

15:15-17:15 Room: Moda

Session 105: Sustainable Water Utilization and Treatment
Chair: Prof. Bilsen Beler Baykal

A Sustainable-Optimal Water Resources Allocation and Agricultural Production Model
Sadık Çökelez

Management of Domestic Wastewater through Segregated Streams as an Aid towards Sustainability of Natural Resources and Sustainable Agriculture/Food Production
Bilsen Beler Baykal

Application of Pervaporation in Environmental Engineering: Vfa Separation via Commercial and Manufactured Membranes
Çağlar Küllü, Hatice Taner, Hatice Yeşil, Adile Evren Tuğtaş

Making Room for Ecosystem Functioning in Urban Water Management
Meltem Delibaş, Burcu Yazıc

Poster Presentation

Purification of Water from Lactic Acid by Amberlite Ira-67 Adsorption
İsmail İnci, İrem İlalan, Nilay Baylan

Recovery of Acetic Acid from Water by Reactive Extraction with Imidazolium-Based Ionic Liquid
Nilay Baylan, Süheyla Çehreli

Sustainable Industrial Effluent Water Quality by Removal of Tartaric Acid with a Nanotechnological Material
İsmail İnci, İrem İlalan, Nilay Baylan

15:15-17:15 Room: Çengelköy

Session 106: Corporate Social Responsibility
Chair: Prof. Aslı Yüksel Mermod

The Relationship between Corporate Social Performance and Corporate Financial Performance: Evidence from Turkey
Meltem Özge Özcanlı , Semra Aşcıgil, Uğur Soytaş

Corporate Social Responsibility Variations According to Firm- Specific Variables: An Empirical Analysis of Turkish Companies
Aslı Yüksel Mermod, Güneş Topçu, Mahmoud Ashour

An Unconventional Example of Corporate Social Responsibility: The Tepav Tepe Index
Sadullah Çelik, Aslı Yüksel Mermod

Corporate Sustainability: Approaches to Diversity Management in Global Context of CSR
Kiraz Öcal

17:30-19:00

Welcome Cocktail in Berenge

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Session 201: Workshop on Sustainable Energy with 100% Renewable Community Power
Chair: Prof. Tanay Sıdkı Uyar

Speakers:

Prof. Tanay Sıdkı Uyar
Solution in Energy: Energy End Use Efficiency and 100% Renewable Energy
President, EUROSOLAR Turkey Renewable Energy Association
Head, Energy Section Marmara University
Member of the Board of Directors, M.U. International Center of Sustainability

Prof. Şener Oktik
The Big Challenge and the Simple Goal: Photovoltaic in a Sustainable Energy Future of Turkey
Chairman, GENSED Turkish Solar Energy Industry Association
Chief Technology Officer, Şişecam

Ozan Sagun
Climate Change Action Plan of Garanti Bank
Project and Acquisition Finance Supervisor, Garanti Bank

Dr. Murat Onuk
Environmental Impacts of Wind Power Plants
Department of Business Administration, Yeditepe University

Wietze Lise
Managing Waste for Energy Use in Turkey
Executive Consultant, Energy Markets / AF-MERCADOS EMI

11:00-11:15

Coffee Break

11:15-13:00 **Room: Moda**

Session 202: Environmental Problems
Chair: Prof. Tanay Sıdkı Uyar

Life Cycle Impact Assessment Analysis on a Cooling System
Zehra Özçelik, Yavuz Özçelik, Nazlı Yaşar

Environmentally Sustainable Deicer Management for an Airport
Fatoş Germirli Babuna, Sinem Akşit Şahinkaya

Performance Analysis of a Cascade Refrigeration System with the Replacement of Hfc Refrigerants with Natural Ones
Barış Yılmaz, Ebru Mançuhan, Nasuh Erdönmez, Mustafa Kemal Sevindir, Deniz Yılmaz

The Relationship between Climate Extremes and Teleconnection Patterns over Turkey
Turan Hacılı, Hakkı Baltacı, Bülent Oktay Akkoyunlu, Mete Tayanç

Friday, December 2nd

Poster Presentation

Climate Proofing in Development Cooperation
Rebecca Froese, Janpeter Schilling, Anna-Malin Frank

Some Remarks on Sustainable Fisheries Management in Turkey
Didem Göktürk, Tomris Deniz, Nurdan Cömert

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Session 203: Stakeholders and Sustainability
Chair: Prof. Refika Bakoğlu

Usability of Academic Websites: Comparison of Stakeholders Perception
Buket Akdol, M. Sabri Toprak, S. Ahmet Menteş

Sustainable Supplier Evaluation and Selection Criteria
Merve Er Kara, Özlem Yurtsever, Seniye Ümit Oktay Firat

The Sustainability of a Family Business in Multiple Perspective: The Case of Uslu Selim Halvah in Uşak
Recep Kurt

Global Value Chains and their Interaction with Sustainable Development
Ulkar Aliyeva

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Session 204: Economic Sustainability
Chair: Assoc.Prof. Sadullah Çelik

Current Account Deficit Sustainability of Turkey in the Period of 1974-2015
Kıvanç Halil Arıç, Serkan Taştan

Do Capital Requirements in Basel III Restrict the Financing of Green Economy? A Case Study of a Turkish Bank
Övünç Gürsoy

An Industrial Policy Recommendation for Raising Solar Energy Investments and Employment in Turkey
Mustafa Erdoğdu, Coşkun Karaca

An Overview of the Applications of Environmental Taxes in OECD Countries and Turkey
Fatma Yapıcı

13.00-14:00

Break for Lunch in Vitas

Friday, December 2nd

14:00-16:00 Room: Moda

Session 205: Renewable Energy Sources and Sustainable Buildings
Chair: Assoc.Prof. Hatice Sözer

Prediction of Renewable Energy Consumption in Turkey Using Artificial Neural Networks
Ayşe Ayçim Selam, Ahmet Kubilay Atalay, M. Övül Arıoğlu Akan

The Evaluation of Economic Contribution of Municipal Solid Waste in Bitlis
Emre Gönel, Faruk Oral, Rasim Behçet

Maximizing Overall Energy Performance of a Multiple Use Building by Integrating Advanced Building System
Hatice Sözer, Ergin Kükrer

Representing the Improvement of Bim Execution through the Building Design Process Base on a Case Study
Hatice Sözer, Didem Duru

14:00-16:00 Room: Çengelköy

Session 206: Environmental Sustainability
Chair: Prof. Ayşe Uygur

Treatment of a Textile Dye in Aqueous Solution Using Fe0/Gac Micro-Electrolysis System
Belgin Karabacakoğlu, Duygu Yamaç

An Overview to Organic Cotton in Turkey
Ayşe Uygur

The Influence of Chemical Pretreatment, Chestnut Wastes and Pinecones Filler Content on Properties of Polyester Composites
Günce Alp Adıguzel, Akpınar Borazan

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Session 207: Corporate Sustainability
Chair: Prof. Ayşe Ümit Gökdeniz

Using Information Systems to Develop CRM on the Road to Sustainability
Taşkın Dirsehan

A Sustainability Implementation Perspective for Environmental Accounting Information Systems in the Corporate Companies
Ayşe Ümit Gökdeniz

A Research on Sustainability Indices: BIST Sustainability Index Study
Artür Yetvart Mumcu, Ozan Emre Ufacık

Poster Presentation

Culture of Sustainability: How Is the Concept of Sustainability Inspiring Innovation?
Raya Tsvetkova, Savina Ezekieva

A General Perception on Improving Quality Control Concept
Ayşenur Erdil, Hikmet Erbıyık

Production of Polyester Composite Material Using Pine Cone Powder as Reinforcement

Duygu Gökdai[1], Alev Akpınar Borazan[1]

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Abstract

Natural fibers reinforced polymer composites have a large area as a progressive material in such industrial applications. Although pine cones have the fibrillar morphology and good mechanical properties they are unusually used as reinforcement in polymer composites. In this study, polymer matrix composites were produced using pine cone waste as reinforcement and polyester as polymer matrix with casting method. Before mixing the polyester and filler the pine cones were chemically treated to avoid the weak coherence between the natural fibers and polymer matrix and to clean their surface and corroborate binding with the polymer. Some mechanical and physical properties of composite materials were analyzed and the composites tested to determine their flexural strength, elastic modulus, hardness also physical features such as density and water absorption was investigated. Increasing ratio of pine cone filler had led to increase of flexural strength values and decrease of elastic modulus. Chemical treatment applied for pine cones reduced the increasing ratio of flexural strength and also decreasing ratio of elastic modulus. Increasing amounts of cones reduced the impact strength and it is supported by increase amount of open porosity. Because the high amount of pine cone has increased both the porosity of composite and water absorption.

Keywords: Polymer matrix composites, pine cone wastes, polyester, mechanical properties

1. Introduction

Recently, there has been a wide interest for the production of natural fiber/particle reinforced polymer composites which have great potential to use in many application areas like construction, packaging, electronics and automotive industries [1]. Because the increasing of environmental problems researchers focused on the new sustainable bio-composite materials [2]. Polymer based composites have some significant features such as light weight, good mechanical and tribological responses [3]. Recently conducted several studies on this subject are available. Arrakhiz et al. researched mechanical and thermal properties of clay and pine cone fibers reinforced polypropylene hybrid composite at a total weight percent of 30. The tensile properties results indicate that the Young's modulus has increased for whole systems reaching a gain of 80%, while tensile strength remained stable with the use of both charges [4]. In other study of Arrakhiz et al. fiber–matrix adhesion was assured by both a styrene–(ethylene–butene)–styrene triblock copolymer grafted with maleic anhydride (SEBS-g-MA) and a linear block copolymer based on styrene and butadiene compatibilizer. Results show a clear improvement in mechanical properties from the use of both alkali treated Pine cone and Pine cone compatibilized with maleic anhydride, a gain of 43% and 49% respectively in the Young's modulus [5].

2. Material and Method

2. 1. Materials

Polyester resin (Polipol 383-G, Poliya Composite Resins and Polymers Inc., density of 1.076±0.05 g/cm^3) was used as polymer matrix in all experiments. While methyl ethyl ketone peroxide (MEKP,Butanox™ M-60, AkzoNobel Products) was hardener used for polyester resins Cobalt 1% solution was used as promoters. Butanox is organic peroxide which reacted with the resin to turn it from a liquid to a solid. Pine cone wastes were used as reinforcement.

The pine cones were dried in air conditions before mixing with the polymer and also they were chemically treated to avoid the weak coherence between matrix and filler.

2.2. Composite Preparation

The polyester matrix was compounded with reinforcement fillings in different ratios by weight. Gas pycnometer Micromeritics the AccuPyc II 1340 model (respectively 4.1120±0.0029 g/cm^3 - 1.4493±0.0010 g/cm^3) was used to measure absolute volume and true density of pine cones.

The pine cone both chemically treated and untreated was first mixed with polyester resin in the indicated ratios. After compounding was performed using a speed of 500, 1000 and 1500 rpm (Stuart scientific mechanical stirrer), cycle time for each 5 minutes, mixture was hold on under the vacuum in 5 min. Then accelerator and hardener were added and the last mixture was poured into a mold. Curing condition for composites were 110°C, 2 hours in an oven (Binder, Germany), 1 day at ambient temperature.

2.3. Measurements

Three point bending tests were applied at a bending speed of 2 mm/min in Shimadzu AG-IC Test Machine. The flexural modulus of the composites was calculated. Durometer Hardness was used to determine the relative hardness of composite samples. Density measurements of the composites were done according to the Archimedes' Principle. To determine the porosity into the composite specimens bulk volume which is the sum of the grain and pore volumes were measured.

3. Results and Discussion

Table 1. Mechanical Properties of Composite Samples

Sample code	Hardness	Izod impact strength (J/mm^2)	Max Force(N)	Flexural Strength(N/mm^2)	Flexural modulus (MPa)
PC1	88	5.27	109.38	59.46	5337.43
PC2	87	5.12	118.75	66.32	5187.54
PC3	86	5.02	125.00	71.69	4667.38
PC1ct*	85	5.14	103.12	53.59	5726.75
PC2 ct	86	4.96	106.25	56.49	5627.45
PC3 ct	87	4.64	115.63	64.65	5089.82

*ct refers chemically treated samples

The experimental results and tests showed that (Table 1) hardness value of composite materials decreased for the unreacted samples by increasing pine cone ratio. For chemically reacted samples hardness increased with the filler ratio. Increasing ratio of pine cone filler had led to increase of flexural strength values and decrease of elastic modulus. Chemical treatment which is applied for pine cones reduced the increasing ratio of flexural strength and also decreasing ratio of elastic modulus. Increasing amounts of cones reduced the impact strength and it is supported by increase amount of open porosity. High amount of pine cone has increased both the porosity of composite and water absorption (Table 2).

Table 2. Physical Properties of Composite Samples

Sample code	Bulk Density (g/cm^3)	Open Porosity(%)	Water Absorption (%)
PC1	1.19	1.86	1.38
PC2	1.19	1.92	1.56
PC3	1.19	1.94	1.64
PC1ct	1.18	2.06	1.75
PC2 ct	1.17	2.25	1.90
PC3 ct	1.16	2.44	2.25

References

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2. Arrakhiz, F. Z., Achaby, M. El., Benmoussa, K., Bouhfid, R., Essassi, E.M., & Qaiss A. (2012). Evaluation of mechanical and thermal properties of Pine cone fibers reinforced compatibilized polypropylene, *Materials and Design* 40, 528-535.
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The Influence of Chemical Pretreated Chestnut Wastes and Pinecones Filler Content on Properties of Polyester Composites

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Abstract

There have been critical concerns about meeting the future demands at a global level because of degradation of natural resources. In particular, to the balance between future demands and sustainable supply have to be gaining much attention in the years to come. The interest in long term sustainability of material resources has make advancements in bio-composites or polymer composites materials which made from natural fibers and resin. Pinecones and chestnut wastes are usually used as biomass/biochar source. Nature proposes, and Man disposes; we have to find or create/ alter new forms of pinecones and chestnut wastes to increase their value and environmental issues. That's why these present wastes were processed and transformed to filler to be up-grade state. In this study, composites were manufactured using of chestnut wastes and pinecone powder as filler and polyester as polymer matrix. And also methyl ethyl ketone peroxide as hardener and cobalt naphthenate as accelerator were used to polyester composite production. Raw materials of fillers were treated with sodium hydroxide and acetic acid solution. Polyester amount was kept in constant and filler ratio was increased from 3% to 12% in weight. The similarities and differences between the composites with different fillers and chemical pretreatment were discussed by evaluating some mechanical properties such as flexural strength, elastic modulus, hardness and some physical features such as density, open porosity% and water absorption. According to experimental results, increasing ratio of both chestnut and also pinecone powder had led to decreasing of the bending strength and increasing of the elastic modulus. The higher properties were associated with chestnut waste/polyester composite then the pinecone powder/polyester composite.

Keywords: Polyester Composite, Pinecone Powder, Chestnut Waste, Bending Properties, Physical Properties.

1. Introduction

Signs of degradation of natural resources worldwide create critical concerns about meeting the future demands at a global level. For keeping balance between future demands and sustainable supply can be the next challenge. Composites usually have become important parts of everyday life for most people. As well as increasing fuel prices there is much pressure from environmental groups and government agencies to seek other means for composites with more environmentally friendly processing and materials [Al Bakri, Ruzaidi, Norazian & Liyana, 2008; Otles, Despoudi, Bucatariu & Kartal, 2015]. Today, rapid technological change and increased competition in many industries necessitate lighter and more high-strength materials to be able to design high-performance products [Gardner et al., 2008; Nagarajan et al., 2013]. Composite structures that can provide desired properties, are obtained when the polymers that do not meet the some of the requested physical and/or chemical characteristics in the application fields, are supported by the fibers in various types and proportions [Fowler et al., 2006; Karpenja et al., 2013]. However, the use of natural fiber and shells instead of textile fibers has become mandatory in recent years because the recycling of reinforcing elements of textile fibrous that are used as support for the composite materials are difficult and their fragmentation lifetimes in the nature are long and production costs are high [Lampinen, 2009; Madsen & Lilholt 2007].

For both the reduction of these problems and for more efficient use of agricultural wastes, production and use of the natural fiber-reinforced composites by supporting bast fibers of the polymers that are generally from the class of herbal fiber of the cellulosic characteristic, with the natural fibers such as fruit and leaf fibers, become remarkable today [Santos Ribeiro et al., 2016]. The use of natural fibers in composite materials is increasing rapidly today while the concepts such as recycling and sustainability are coming to the fore. The biological degradability and recyclability of natural fibers that are used as reinforcing materials have been developed in the face of the use of synthetic fibers, thanks to their low density, high specific strength values as well as renewability of their herbal natural resources. Thus, the components that make up the material gain a great importance for the development of composite material of different properties [Huber et al, 2012; Kreindl, 2012]. Fiore and his colleagues, according to the results of their research, showed that Artichoke fibers can be used as a valid alternative for glass fibers in the composite materials [Fiore et al. 2011]. In another study conducted by Sewench and colleagues in 2013, increasing amount of filler in the production of epoxy composites with chestnut shell filler has shown that some mechanical, thermal, dielectric properties have been improved [Sewench et al., 2013]. On the other hand, according to the results of the research done by Chensong and his friends in 2011, it has been found that visible gaps of the polyester composite samples that are reinforced with macadamia nut shell particles, have increased with the increasing reinforcement but their bending properties have not changed much. However, it was identified with the studies done by Wu and his colleagues that the composite materials that have been obtained from the chestnut husk fiber (CSF) and polyhydroxy alkynoate (Pha) have biodegradability and biocompatibility [Chensong et al., 2011; Wu et al., 2014]. Our country has an important production potential because the climate and soil properties of our country are suitable for the cultivation of chestnut. According to FAO and TUIK data, the People's Republic of China met alone 1 million 650 thousand of the 1 million 998 thousand 880 tons' chestnut production of the world in 2013. The share of this country in the world production exceeds 82.5%. South Korea comes second in the production with 70 thousand tons and Turkey comes third with 60 thousand tons [FAO, 2013].

In this study, chestnut shell waste and pinecone powder at an increasing rate are used as reinforcement material in the production of polyester composite that is done in metal casting mold in the laboratory. Additionally, effect of applied chemical pretreatments is obtained by comparing the mechanic and physical test results that obtained in the polyester composites produced by both filler materials.

2. Material and Method

In experimental studies, polyester resin was used as the matrix material. The filling material chestnut shell wastes were obtained from the chestnut candy company in Bursa, and other filling materials (pine cones) were collected from the University garden. The polyester resin (Polipol383-G) with a density of 1.076±0.05 g/cm^3 in the main matrix that was obtained from the Poliya Composite Resins and Polymers Inc. was used. For curing a methyl ethyl ketone peroxide (MEKP. Akzo Nobel Products) with resin to hardener ratio of 3/100 wt% was added. 2% Cobalt solution was used as an accelerator in the mixtures. For determining of mechanical and physical properties 18 material specimens were cast with size 10mm x 4 mm x 100 mm (see figure.1).

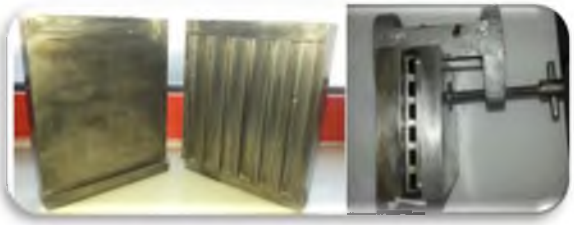

Figure 1. Pictures of the cast

The theoretical densities of fillers were determined by using a Micromeritics brand AccuPyc II 1340 model Helium-gas pycnometer (Table 1).

Table 1: Filling materials theoretical density and volume

Material	Mean Density (g/cm^3)	Mean Volume (cm^3)
Pinecone Powder	1.4179± 0.0008	1.9555± 0.0011
Chemically Treated Pinecone Powder	1.4492± 0.0007	1.8737± 0.0009
Grinded Waste Chestnut Shell	1.4722± 0.0007	2.2621± 0.0011
Chemically Treated Grinded Waste Chestnut Shell	1.5248± 0.0007	1.7273± 0.0008

The filler percentage range was chosen based on the recommended filler concentration similar previous work in literature related with wood composites (Table 2).

Table 2. Detailed designation and composition of composites

Sample Code		**Filler *[wt%]**		**Polyester *[wt%]**
		****P**	****C**	
Pinecone powder/ polyester Composites	**PC1**	6	0	94
	PC2	9	0	91
	PC3	12	0	88
Chemically treated Pinecone powder/ polyester Composites	**PC1ct**	6	0	94
	PC2ct	9	0	91
	PC3ct	12	0	88
Grinded Chestnut shell / polyester Composites	**CC1**	0	6	94
	CC2	0	9	91
	CC3	0	12	88
Chemically Grinded Chestnut shell / polyester Composites	**CC1ct**	0	6	94
	CC2ct	0	9	91
	CC3ct	0	12	88

[wt%]: Weight Percent
*****P: pine cone powder. C: Grinded Chestnut shell. ct: Chemically treated material***

Fillers are first dried in the laboratory condition then grinded with a hammer mill and sieved. After then separated into two parts and the half was treated with a solution of 1.6 Mol/l sodium hydroxide. One part is washed with 0.6 Mol/l acetic acid solutions to be neutralization and checked with pH meter. They are filtered into Buchner funnel and the last are dried in the oven at 105°C. Polyester and prepared fillers are weighed in proportions specified in the recipe (Table 2). They are blended for 5 minutes at a speed of respectively 500, 1000 and 1500 rpm by using mechanical stirrer (Stuart scientific stirrer SS3, UK). After a homogeneous mixture is obtained the specified amount of the accelerator and hardener has been added. The mixture is poured into molds and kept for 2 hours at room temperature, then it is removal from the mold. 1 day later is achieved curing in the oven at 105 °C.

The mechanical and physical properties of the obtained composite materials were determined by applying three-point bending test, shore-D hardness test, and water absorption tests. The results of the analysis of the tests are calculated based on the average value.

3. Results and Discussion

Both powder of the waste chestnut shell and the pine cones applied to the chemical process in the production of composite materials resulted in little decrease in the bulk density.

Chemical process applied both to cones and to the shell of chestnut powder has led to the visible change in porosity in the production of composite materials prepared with increasing reinforcement filler. The open porosity in the chemical process applied waste cones' dust increased with increasing supplementation in composite samples.

The open porosity reached to 25% in samples with the highest dust cones PC3ct. This situation has developed differently in composites which are added the waste chestnut shell. The open porosity increased with the application of chemical operation and with the increasing amount of reinforcement. However. this increase decreased depending on the increased the rate of reinforcement (Table 3.).

Table3. Effect of various filler loadings and chemical pretreatment on density and dimensional properties of composite samples

Sample code	Bulk Density (g/cm^3)	Apparent Porosity. (%)	Water Absorption. 24hrs (%)
PC1	1.19	1.86	1.38
PC2	1.19	1.92	1.56
PC3	1.19	1.94	1.64
PC1$_{ct}$	1.18	2.06	1.75
PC2$_{ct}$	1.17	2.25	1.9
PC3$_{ct}$	1.16	2.44	2.25
CC1	1.19	1.88	1.58
CC2	1.18	2.39	2.02
CC3	1.18	3.12	2.63
CC1$_{ct}$	1.19	2.37	2.00
CC2$_{ct}$	1.19	2.51	2.12
CC3$_{ct}$	1.18	3.05	2.59

When the 24-hour water absorption results of polyester composite samples are reviewed. It is observed that they have a parallel development with the results the open porosity. Both the chemical process applied to pollen cones and both chestnut shell has increased the amount of water absorption. Additionally, the chemical process that is applied to chestnut shell showed the positive effect and it was enabled to gradually reduce this decline with the addition of increasing amounts of supplements (Table 3).

Chemical process applications both pinecone powder and grinded waste chestnut shell of composite materials has been effective in different level on impact resistance and hardness values. Increased rates of the cone and the pretreatment application made caused to a decrease in impact resistance and hardness values. However grinded waste chestnut shell/ polyester composite applications are positively affected from both increasing in the rate of reinforcement and pretreatment operation; an increase in the impact resistance and hardness values was observed (Table 4).

Max strength that is applied to break the specimen in the bending test has showed an increase in the powder waste of pinecones and decrease in chestnut shell depending on reinforcement ratio. it was observed that lower forces was exposed to samples produced with cones filler and higher force was applied samples produced with chestnut waste for breakage of polyester composite samples through the use of chemical processing supplements.

Table 4. Some Mechanical properties of composite samples

Sample code	Max Force N	Flexural Strength N/mm^2	Flexural modulus MPa	Izod impact strength (J/mm^2)	Hardness. Shore-D
PC1	109.38	59.46	5.337.43	5.27	88
PC2	118.75	66.33	5.187.55	5.12	87
PC3	125.00	71.69	4.667.39	5.02	86
PC1$_{ct}$	103.13	53.59	5.726.75	5.14	85
PC2$_{ct}$	106.25	56.49	5.627.46	4.96	86
PC3$_{ct}$	115.63	64.66	5.089.82	4.64	87
CC1	146.88	89.15	2.984.32	4.76	84
CC2	143.75	77.61	3.299.57	5.00	87
CC3	128.13	72.20	3.369.73	5.30	88
CC1$_{ct}$	150.00	87.68	3.487.71	5.24	88
CC2$_{ct}$	143.75	74.13	3.576.19	6.65	89
CC3$_{ct}$	131.25	70.90	3.669.24	6.89	91

Increasing reinforcement ratio calculated according to the results obtained with three-point bending test. an increase of bending strength in the those with cones supplements. a decline I those with chestnut supplement. in contrast to the reverse effect has caused in bending module. Also. it was determined that process of the chemical application reduced in general elastic strength of the composite samples in which both chestnut and cone waste is used. but increased the elastic modulus values.

As illustrated by the literature presented in this paper and reported from many research's lignocellulosic materials have been often and increasingly applied as fillers of polymer composites. Production of composites of very good macroscopic properties is not easy and many aspects need to be considered. As a conclusion, chemical pretreatment developed physical and mechanical properties in polyester composite samples of the waste chestnut shell powder. it has been seen that it has a negative impact on the composite polyester sample of pinecones powder. One of the most important problems is insufficient adhesion between the phases of polymer matrix and lignocellulosic filler [Bulut & Erdoğan. 2011; Paukszta & Borysiak. 2013]. It is thought that both fillers did not provide desired mechanical effects because of the incompatibility of hydrophilic character of the natural fibers with hydrophobic properties of a polymer matrix. which can be solved by different types of chemical or physical modifications of the composite components. The use of the coupling agent is planned to enhance the interaction between phases in the continuation of the study. Besides the physical and mechanical properties the filler amount influences the cost of the product. By lowering the resin content in the composition of the particle filled composite one can lower the costs. Resin is relatively expensive compared to all kinds of fillers. This is the main motivation that drives the manufacturers to search for possibilities to lower the filler content [Aruniit et al. 2011].

Successful commercialization of chestnut shell& pinecone/polyester composite products depends on development of a cost-effective manufacturing process on a commercial scale and establishment of a market base for the sustainable products. This will be also lead reducing and preventing wastes.

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