

Evaluation of challenges of wood imports to Iran using fuzzy delphi analytical hierarchy process

Abstract

Considering the increasing consumption of wood and wood products in Iran and limited domestic sources of wood and shortage of wood raw material in Iran, wood raw material imports is a solution for Iranian developing wood industries. Nonetheless, wood imports to Iran always faced a lot of challenges. The aim of this research was to determine and evaluate the challenges in the way of wood imports to Iran. The research method used in this study was a descriptive-analytic method. The analytic method used in the study to evaluate the challenges was the Fuzzy Delphi Analytical Hierarchy Process (FDAHP). First, the findings of previous researches in the field and the literatures were studied. Then, doing interviews with industry experts, the challenges in the way of wood imports to Iran were extracted and classified in five groups and 35 factors. The results shows that in the first level (groups), the regulations, economic, politics, infrastructure and management groups are the most import factors, respectively. In second level (challenges), plant protection regulations have the most importance. After that, exchange rate tolerance, oil income, banking support and GDP have the most importance, respectively.

Keywords: FDAHP, import, challenges, factors, wood.

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Received: 2016/08/13
Accepted: 2016/09/14

Identifying the function of rehabilitated and activated methyl cellulose glue for preparation of tissues used in restoration of paper works

Abstract

This research aimed to facilitate the use of methyl cellulose adhesive to repair paper works in which their ink are sensitive to water. This research was conducted by analytical comparisons method and samples were collected by experiments related to research topics such as pH measurement, calorimetric, infrared spectroscopy with total attenuated reflection (FTIR- ATR), the measurement of tensile strength as well measurement of the adhesive strength of the samples. First, the adhesive (methyl cellulose) was prepared at a concentration of 7% in methanol. Then, the prepared specimens were treated under temperature-humidity accelerated aging in accordance with ASTM D4714-96 standard for 384 hours and under light in accordance with ASTM D6789-02 for 360 hours. Changes of color, pH, tensile strength and adhesion were monitored. Results showed that the pH of samples changed from 6.91 to 6.39 after light aging and to 6.06 after temperature-humidity aging. Moreover, tensile strength of samples were reduced from 0.31 to 0.23 kN per meter after light aging and to 0.24 kN per meter after the temperature-humidity aging. Also, the adhesive strength of the samples decreased from 1.43 to 0.97 Newton after light aging and to 1.51 Newton after temperature-humidity aging.

Keywords: methyl cellulose glue, activation, rehabilitation, tissue, restoration of paper works.

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Received: 2016/05/09
Accepted: 2016/10/09

The mechanical and morphological properties of recycled polyethylene-MDF saw dust composites

Abstract

The aim of this study was to investigate the effect of using recycled polyethylene on the mechanical properties of PE-MDF composite. Saw dust as a filler at 30% and MAPE as coupling agent at two levels of 0 and 2 wt% were mixed in an internal mixer and the samples were prepared by injection molding method. Mechanical properties such as tensile and flexural (strength and modulus) were measured. Morphology of composites was also evaluated by scanning electron microscopy (SEM). Although virgin polyethylene had better mechanical properties than once and twice recycled polyethylene, but with the addition of sawdust as filler consisting of recycled polyethylene composites, mechanical properties significantly increased. The results of mechanical properties showed an improvement by the addition of MAPE. The SEM micrographs showed that the use of twice recycled polyethylene and MAPE led to the better interactions between matrix and filler. The melt flow index (MFI) indicated that with increasing number of recycled polyethylene, melt flow index increased. Therefore, according to the results of mechanical properties, it can be concluded that increasing the melt flow index has a positive effect on composite construction.

Keywords: recycled polyethylene, saw dust, binder, mechanical properties.

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Received: 2015/05/27
Accepted: 2016/10/29

Investigation of physical and mechanical properties and formaldehyde emission of medium density fiberboard manufactured from urea formaldehyde resin reinforced with nanocrystalline cellulose

Abstract

The purpose of this study was to evaluate the physico-mechanical properties and formaldehyde emission of medium density fiberboard (MDF) made from modified urea formaldehyde resin. In this study, nanocrystalline cellulose (NCC) (0, 0.5, 1, 1.5 and 2 percent) based on the dry weight of resin was applied to modify urea formaldehyde resin. The results of mechanical properties indicated that MOR and IB of the MDF panels significantly increased as the NCC incorporated into the UF adhesive up to 1% wt. However, further increment in the NCC content (1.5 and 2 wt%) decreased the MOR and IB of the panels. Water absorption and thickness swelling after 2 h were significantly increased when the NCC content increased from 1% to 2%, but no significant differences were observed between the panels after 24 h. Moreover, the formaldehyde emission significantly decreased with increasing the amount of nanocrystalline cellulose.

Keywords: physical-mechanical properties, medium density fiberboard, urea formaldehyde resin, nanocrystalline cellulose.

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Received: 2016/07/23
Accepted: 2016/11/21

A Survey on biodegradation, hardness and dimensional stability of a hybrid composite of wood flour / polypropylene / glass fiber in different circumstances

Abstract

In this study, the effect of cellar fungus (*conophora cerabella*; brown rot) on biodegradability, hardness and dimensional stability of wood flour/polypropylene/glass fiber hybrid composites were studied after immersion in water. Samples were composed of 40 to 60, 50 to 50 and 60 to 40 percent of wood flour / PP weight ratios, respectively and three levels of glass fibers i.e. 0,10 and 15 weight percent. Samples were then immersed in water at 25 and 40°C, sea water and pool water for 1608 hours and then exposed to the cellar fungus for 6 weeks. The results showed that by increasing the wood flour weight ratio and adding glass fiber to composite samples, respectively, weight loss increased and decreased. Overall, after immersion in water, samples had greater weight loss compared with control. Immersed samples in pool water and hot water of 40°C, showed greater amounts of weight loss compared with the others. With an increase in wood flour weight ratio and adding the glass fiber in hybrid composite, the hardness of samples increased. Overall, after soaking in water, the test samples showed lower hardness, compared with the control. By increasing the wood flour ratio in composites, the water absorption and thickness swelling amount increased. Adding glass fiber to composites in all ratios of wood flour reduced and controlled the water absorption and thickness swelling.

Keywords: hybrid composites, glass fiber, brown rot fungus, environmental conditions, weight loss, hardness.

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Received: 2016/08/27
Accepted: 2016/12/18

Application of GPR technique in evaluation of internal defects in hardwood species

Abstract

Non-destructive testing of materials to assess their properties is continuously developing. Ground penetrating radar (GPR) as a non-destructive method is based on the transmission of electromagnetic energy and recently has been applied in field of wood and wood products. In this study, GPR technique was used to evaluate the internal defects in three hardwood species with three moisture content levels. In order to remove determinant extrinsic and uncertain factors, several artificially defects were created within the wood samples. Data collection was done by MALA CX GPR in center frequency of 2300 MHz and processed with Reflexw software. This study showed that dielectric properties on wet-woods are more than dry-woods and internal defects can better be detected in wet wood than dry woods. However, the holes with diameters of 4 mm and less were not detectable. In general, GPR, as a safe and portable method, is capable for detecting internal defects and voids in hardwood.

Keywords: non-destructive test, ground penetrating radar, internal defects of woods, dielectric properties.

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Received: 2016/10/18

Accepted: 2016/12/20

Investigation on the possibility of producing the pulp and paper from weeds

Abstract

Increasing use of wood products accompanying with resource constraint has revealed the importance of nonwood based materials. In this study, pulping and papermaking potential of three varieties of weeds including *Xanthium spinosum*, *Carthamus tinctorius* and *Cyperus papyrus* have been considered. At first, chemical components of the samples i.e. cellulose, lignin and extractives were measured following TAPPI standard test methods. Afterwards, pulping process based on soda and Kraft was carried out and the pulp and paper properties including screen yield, reject percentage, kappa number, physical, strength and optical properties were evaluated. According to the results, the amounts of cellulose, lignin and extractives of *Xanthium spinosum* was 38.15%, 13.5% and 4.72%, respectively. These parameters were estimated to be about 38.25%, 10.3% and 2.95% for *Carthamus tinctorius* and 38.8%, 19.2% and 4.4% in case of papyrus. The yield of soda and Kraft pulp from the papyrus was more than *Xanthium spinosum* and *Carthamus tinctorius*. Among all treatments, the highest screen yield was related to soda pulping of *Cyperus papyrus* by 39.8% which was obtained by 90 minutes cooking at 175 °C as the maximum temperature, L/W: 6/1 and active alkaline of 30%. The lowest and the highest amounts of the tear index were related to soda pulp sample of the *Carthamus tinctorius* and Kraft pulp sample of *Xanthium spinosum* by 2.49 and 8.1, respectively. In addition, the lowest and the highest values of bursting indices were related to soda pulp sample of the *Cyperus papyrus* and Kraft pulp sample of *Xanthium spinosum* by 0.61 and 2.48, respectively. Meanwhile, soda pulp sample of the *Cyperus papyrus* showed the highest brightness of 45% ISO.

Keywords: weeds, lignocellulosic materials, yield, pulp, kappa number, paper strength, brightness.

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Received: 2016/07/17

Accepted: 2016/12/20

The Effect of wheat straw particle size on the mechanical and water absorption properties of wheat straw/low density polyethylene biocomposites for packaging applications

Abstract

Natural composites with biodegradability properties can be used as a renewable alternative for replacing conventional plastics. Thus, to reduce the plastics applications in the packaging industry, biocomposites were produced containing wheat straw (with 40, 100, 140 mesh) as a natural biodegradable composite and low density polyethylene (LDPE) as a common synthetic polymer in the packaging industry. The effect of wheat straw particle size on the mechanical and water absorption properties of these biocomposites was studied. Polyethylene-graft-maleic anhydride was used as a compatibilizer material. Morphology of wheat straw flour was studied by optical microscopy to obtain the aspect ratio (L/D). The tensile and flexural tests were applied for determining the mechanical properties and scanning electron microscope (SEM) was used to assess particle distribution and sample structure. The water absorption of the samples was calculated by weight differences. The results indicated that the particle size of wheat straw and the L/D amount significantly affected the tensile strength and water absorption of the samples. However, the effect of wheat straw particle size on the flexural strength was not significant. Overall, it can be concluded that by increasing the particle size of the filler (wheat straw), biocomposites with better tensile strength and less water absorption can be prepared.

Keywords: biocomposite, mechanical and water absorption properties, low density polyethylene, particle size, wheat straw.

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Received: 2016/07/14
Accepted: 2016/12/31

Penetrability of nano-wollastonite into the poplar wood and its effect on wood durability and dimensional stability

Abstract

In recent years, much attention has been paid to nanotechnology for improving wood defects. Wollastonite as a mineral is commonly used in the production of plastic, ceramic and concrete. Wollastonite production in nanoscale has increased interest in using it. Recently, a large number of studies have been carried out in Iran aiming to improve durability, dimensional stability, and flammability of wood and wood products using nano-wollastonite. Based on the promising results obtained in these researches, this study was conducted as a complementary investigation to verify nano-wollastonite penetrability into the wood as well as its effects on biological durability and dimensional stability. The results showed that nano-wollastonite could not penetrate into the xylem since wood texture serves as a filter against it. The treated samples with nano-wollastonite showed partly resistance against white rotting fungus, but this was lost after a short-time leaching. Nano-wollastonite had no effect on the water absorption and volumetric shrinkage of treated samples. Base on the results of this study, nano-wollastonite is not recommended for wood impregnation industry, at least when raw wood is concerned.

Keywords: dimensional stability, fungal decay, retention, nano-wollastonite, weight gain.

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Received: 2016/12/07
Accepted: 2016/01/14

The effect of coatings and coating weight by two types of PCC on barrier and optical properties and roughness of paper

Abstract

The objective of this work was to investigate the use of PCC, and the impact of its coating weight on paper coating. In this study, two base papers from Mazandaran Wood and Paper Industries (APC and NS), and two coating compositions with the solid content of 25% containing PCC filler (100 parts), PVA binder (14 parts) and dispersant (1 part) were used. The first composition included PCC B102 for opacity increment, and the second one, PCC 9020 for the improvement of brightness. Two rods RDS14 and RDS30 were used for different coating weights. After coating, the treated samples were dried in room conditions at air temperature of 25°C and relative humidity of 54%. Physical and optical properties of control and treated samples such as air resistance, thickness, Cobb60, brightness, yellowness, opacity and roughness were determined. In comparison to the control group, all the treated samples showed improvement in brightness, opacity, yellowness and air resistance. By the two different formulations and two rods, paper roughness was increased, and the increment of water absorption was due to capillary development in coating texture. The analysis of variances showed that the usage of PCC 9020 had considerable effect on roughness of papers. In NS papers, change of PCC caused significant difference in brightness and roughness, but in APC papers did not. The change of coating rod in APC papers had significant effects on water absorption, brightness and opacity but did not show a significant effect in NS.

Keywords: coating, optical properties, roughness of paper, PCC.

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Received: 2016/11/11
Accepted: 2017/01/30

Analysis of stress- strain distribution of dowel and glue line in L-type furniture joint by means of finite element method

Abstract

In this study, 3D stress-strain distribution of dowel and glue line on L-type joints made of plywood doweled was investigated. Members of joints were made of 11-ply hardwood plywood (hornbeam, beech and alder) that were 19 mm in thickness. In this study, effect of beech dowels was investigated in three level diameters (6, 8 and 10 mm) and penetration of depth (9, 13 and 17 mm) on bending moment capacity of L-type joints under compression loading as experimental test; then, stress-strain distribution of wood dowel and glue line in specimens were simulated by means of ANSYS 15 software with finite element method (FEM). Results showed that the bending moment resistance increased with increasing dowel diameter from 6 to 8 mm, but downward trend was observed with increasing 8 to 10 mm in dowel diameter. Bending moment resistance increased with increasing penetration depth. Also, simulation by ANSYS software showed that stress-strain in dowel and glue line increased with increasing diameter of dowel and this increased stress in joints made of 10 mm dowel decreased the resistance due to fracture in joints. According to results obtained of model analysis, the ultimate stress of dowel and glue line occurred in the areas in which joints were contacted.

Keywords: stress, strain, wood dowel, L-type joints, finite element method.

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Received: 2017/04/23
Accepted: 2017/07/09

Effects of protection treatments on preventing log checking (Case study: Kheyroud forest)

Abstract

Remaining of the logs in the stump area and especially along the forest roadsides can increase the check in the cross sections caused by growth stresses in both sides of the log. All these factors will lead to a decline in the quality of the logs, which can be lined up in the ends of the logs with suitable coating materials such as end coating and anti-checking iron treatments to prevent log checking. A field-based study was performed to study the effects of end coating and anti-checking iron treatments on preventing log checking in beech and hornbeam logs in Gorazbon district in Kheyroud forest, northern Iran. In this study, 180 logs were randomly selected from two species; beech and hornbeam and for any species, 30 logs were selected for anti-checking iron treatments, 30 logs for paraffin treatments and 30 logs as control. Duncan's test showed that in the hornbeam logs, anti-checking iron treatments caused the lowest checking compared with the paraffin and control treatments and this difference was statistically significant. Duncan's test showed that in the beech logs, anti-checking iron treatments caused the lowest checking compared with the paraffin and control treatments. It can be concluded that the lowest check has been shown in the anti-checking iron treatments in two beech and hornbeam logs and this treatment has the greatest role in preventing ends check in comparison with the paraffin treatment.

Keywords: log, grading, check, end coating, anti-checking iron.

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Received: 2016/11/15
Accepted: 2017/03/23

Investigation the quality of recycled medium density fiber boards via two different method i.e. hydrothermal and ohmic heating

Abstract

In this study, recycled fibers from hydrothermal and ohmic heating were used to manufacture medium density fiberboard (MDF). The purpose of this study was to determine the effect of recycling method on practical properties (bending strength, modulus of elasticity, internal bonding and screw holding in edge and surface and thickness swelling after 24-hour immersion in water) of the boards. In addition, a morphological analysis was done to evaluate the influence of recycling process on fiber dimensions. The results of classification and dimension analysis of fibers confirmed the negative influence of recycling process on quality of fibers. Moreover, fiber deformation in hydrothermal recycling was higher than that of ohmic recycling due to sever condition of heating. Physical and mechanical properties of boards made with ohmic heated fibers were better compared to the hydrothermal method. Overall results showed that MDF panels made from recycled fibers via ohmic heating method exceed the minimum values required by EN standards (EN 622-5, 2006) for all properties but thickness swelling. Increasing the time of ohmic heating led to an improvement in practical properties of recycled MDF boards. It was observed by SEM that much more residues of cured UF resin adhesive were existed on the surface of recycled fibers via hydrothermal method.

Keywords: medium density fiberboard, recycling, hydrothermal treatment, ohmic heating, fiber classification

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Received: 2016/02/07

Accepted: 2016/05/28