

2019 春季 學術發表 要旨集

2019 PROCEEDINGS OF THE KOREAN SOCIETY OF WOOD
SCIENCE AND TECHNOLOGY ANNUAL MEETING

2019年 4月 12日(金)~13日(土)
(충북대학교)

주최



한국목재공학회

Korean Society of Wood Science and Technology



충북대학교 농업과학기술연구소

Institute of Agricultural Science and Technology

후원



농림축산식품부



산림과학원



산림과학원



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Session E : Wood Composite Material (목질복합재료)

좌장 : 이중명 (경북대학교)

- 10:40 - 10:50 E-09 **목재-마그네슘 적층복합재(WM Board)의 물리적 및 기계적 성질**
Physical and mechanical properties of wood-magnesium laminated composite(WM Board)
 박희준, 조석운, 강춘원
 Hee-jun Park, Seok-un Jo, and Chun-won Kang
 전북대학교 주거환경학과
 Department of Housing Environmental Design, College of Human Ecology, Chonbuk National University, Korea
- 10:50 - 11:00 E-10 **국내 10개 수종으로 제작한 파티클 보드의 물리적, 기계적 성질에 관한 연구**
A Study on Physical and Mechanical Properties of Particleboard using 10 Korean Species
 누르디안샤 무함마드 갈리, 양승민, 강석구
 Nurdiansyah Muhammad Galih, Seung Min Yang, Seog Goo Kang
 충남대학교 농업생명과학대학 바이오복합재료학실
 Department of Bio-based Materials, Chungnam National University, Daejeon 34134, Korea
- 11:00 - 11:10 E-11 **Tuneable Oxidized Starch Adhesives for Recycling of Medium Density Fiberboards**
 Muhammad Adly Rahandi Lubis, Byung-Dae Park*, Min-Kug Hong
 Department of Wood and Paper Sciences, Kyungpook National University, Daegu, 41566, Republic of Korea
- 11:10 - 11:20 E-12 **폐MDF의 수거를 위한 “폐목재 집하장 분리수집제” 제안**
The proposal of “ Waste Wood Yard Separate Collecting System” for collection waste MDF
 노정관¹, 조현진², 박병대³
 JeongKwan Roh¹, Hyun-Jin Jo², Byung-Dae Park³
¹경남과학기술대학교 건설환경공과대학 인테리어재료공학과, ²조현진한지연구소,
³경북대학교 농업생명과학대학 임산공학과
¹Department of Interior Materials Engineering, Gyeongnam National University of Science Technology
²Jo Hyun Jin Hanji Research Center,
³Department of Wood and Paper Sciences, Kyungpook National University
- 11:20 - 11:30 Discussion

Poster Presentation

Session A : Wood Anatomy (목재조직)

- P-01* **지리산국립공원 영신봉 구상나무의 고사연도 및 시계열적 생육패턴 조사**
Investiong the Mortality of *Abies koreana* at Yeongshinbong in Jirisan National Park and Their Inter-annual Growth Pattern
 박준희¹, 최은비¹, 김요경², 박홍철³, 서정욱²
 Jun-Hui Park¹, En-Bi Choi¹, Yo-Jung kim², Hong-Chul Park³, Jeong-Wook Seo²
¹충북대학교 임산공학과, ²충북대학교 농업생명환경대학 목재·종이학과, ³국립공원공단 국립공원연구원
¹Department of Forest Products, Chungbuk National University, Republic of Korea
²Department of Wood & Paper Science, Chungbuk National University, Republic of Korea
³Korea National Park Research Institute, Republic of Korea
- P-02 **국내 유용수종의 해부학적 특성**
Anatomical characteristics of commercial species in Korea
 전우석¹, 이현미¹, 안지영², 이재환²
 Wooseok Jeon¹, Hyunmi Lee¹, Jaiwan Lee², Jiyoung Ahn²
¹국립산림과학원 목재가공연구과 ²국립산림과학원 산림생명정보연구과
¹Division of Wood Processing, National Institute of Forest Science
²Division of Forest Genetic Resources, National Institute of Forest Science
- P-03 **산림전통지식 유형 분류에 따른 목재 수종 식별 연구**
Identification of wood species according to traditional forest knowledge classification
 이현미¹, 전우석¹, 박찬열²
 Hyun Mi Lee¹, Woo Seok Jeon¹, Chan Ryul Park²
¹국립산림과학원 목재가공연구과 ²국립산림과학원 도시숲연구센터
¹Division of Wood Processing, National Institute of Forest Science
²Urban Forests Research Center, National Institute of Forest Science
- P-04 **국내 유통 목재의 수종 식별**
Species identification of distribution wood in Korea
 송주훈¹, 양원모¹, 전우석², 이현미²
 Joohoon Song¹, Wonmo Yang¹, Wooseok Jeon², Hyunmi Lee²
¹한국건설생활환경시험연구원, ²국립산림과학원 목재가공연구과
¹Korea Conformity Laboratories
²Division of Wood Processing, National Institute of Forest Science
- P-05* **k-Nearest Neighbor와 합성곱신경망에 의한 국산 침엽수재 표면의 용이 종류 분류**
Wood Surface Knot Classification of Domestic Conifer Using k-Nearest Neighbor and Convolutional Neural Network
 김현빈¹, 김민규¹, 박용건^{1,2}, 양상윤^{1,2}, 정현우², 여환명^{1,2*}
 Hyunbin Kim¹, Mingyu Kim¹, YonggunPark^{1,2}, Sang-Yun Yang^{1,2}, Hyunwoo Chung¹, Hwanmyeong Yeo^{1,2*}
¹서울대학교 산림과학부, ²서울대학교 농업생명과학연구원
¹Department of Forest Sciences, Seoul National University
²Research Institute of Agriculture and Life Sciences, Seoul National University

Session A : Wood Anatomy (목재조직)

- P-06 **목재 셀룰로오스의 머서화에 열처리 온도 및 목분입자 크기가 미치는 영향**
Effects of particle size and temperature on the mercerization of wood cellulose
 김아란, 이희수, 푸루사타마 비안타라 다르산, 김남훈
 Ahran Kim, Heesoo Lee, Byantara Darsan Purusatama, and Namhun Kim
 강원대학교 산림바이오소재공학과
 College of Forest and Environmental Sciences, Kangwon National University, Korea
- P-07* **Cross-field Pits Features of Compression, Lateral and Opposite wood in a Stem Wood of *Ginkgo biloba* and *Pinus densiflora***
 Byantara Darsan Purusatama, Nam Hun Kim*
 Department of Forest Biomaterials Engineering, College of Forest and Environmental Sciences, Kangwon National University, Chuncheon 24341, Republic of Korea
- P-08* **보물 제 1730호 창녕 관룡사 목조석가여래삼불좌상 수종 및 도금층 분석**
Analysis of plating layer and Species Identification about Changnyeong gwallyongsa Temple (Wooden Seated Sakyamuni Buddha Triad, Treasure 1730)
 이의천¹, 김수철²
 Uicheon Lee¹, SooChul Kim²,
¹한국전통문화대학교 문화유산전문대학원 문화재수리기술학과,
²한국전통문화대학교 문화재보존학과
¹Dept. of Heritage Conservation and Restoration, Graduate School of Cultural Heritage, Korea National University of Cultural Heritage
²Dept. of Conservation Science, Korea National University of Cultural Heritage
- P-09 **보물 제1271호 수도사노사나불괘불탱패불합 연대분석**
Dating of Wooden Storage Box for Hanging Painting of Sudosa Temple(Rocana Buddha, Treasure 1271)
 이광희, 김수철
 Kwanghee Lee, Soochul Kim
 한국전통문화대학교 문화재보존학과
 Dept. of Conservation Science, Korea National University of Cultural Heritage
- P-10 **함안 성산산성 목계유물 수종분석**
Species Identification about Wooden relics in Haman Sung-San mountain fortress
 이광희¹, 박정혜², 오정은², 박지현², 이의천², 서연주², 박진영¹, 김수철¹
 Kwanghee Lee¹, Junghae park², Jeongeun Oh², Jihyeon Park², Uicheon Lee²,
 Yeonju Seo², Jinyoung Park¹, Soochul Kim¹
¹한국전통문화대학교 문화재보존학과,
²한국전통문화대학교 문화유산전문대학원 문화재수리기술학과
¹Dept. of Conservation Science, Korea National University of Cultural Heritage,
²Dept. of Heritage Conservation and Restoration, Graduate School of Cultural Heritage, Korea National University of Cultural Heritage

Session B : Wood Physics & Drying (목재물리, 목재건조)

- P-11 **19세기(1828) 제작된 뒤효의 특성분석**
Analysis on the Characteristics of Rice Chests Produced in 19th Century(1828)
 김병로, 김지열
 Byungro Kim, Jiyeol Kim
 충북대학교 목재·종이과학전공
 Department of Wood and Paper Science, Chungbuk National University, Korea
- P-12* **온열욕 겸용 숯가마의 설계**
Design of a thermal therapy kiln
 이희수, 김남훈
 Hee-soo Lee, Nam-hun Kim
 강원대학교 산림소재공학과
 Department of Forest materials Engineering, College of Forest and Environmental Sciences, Kangwon National University, Republic of Korea
- P-13* **참오동나무재의 수분 특성**
Hygroscopic properties of Royal paulownia wood
 조재익, 김남훈
 Jaeik Cho and Namhun Kim
 강원대학교 산림소재공학과
 College of Forest and Environmental Sciences, Kangwon National University, Korea
- P-14 **콘칼로리미터를 이용한 주요 건축부재목재의 연소특성 연구**
Combustion properties of wood in building components from cone calorimeter test
 김민지, 김세종, 김건호
 Minji Kim, Sejong Kim, KeonHo Kim
 국립산림과학원 목재이용연구부 목조건축연구과
 Forest Products Dept, Timber Engineering Div.
- P-15* **목재 고열처리 정도의 정량화 및 검량방법**
Quantification of Wood Heat Treatment Degree and Calibration Method
 정현우¹, 양상윤^{1,2}, 김현빈¹, 박용건^{1,2}, 박주생³, 여환명^{1,2*}
 Hyunwoo Chung¹, Sang-Yun Yang^{1,2}, Hyunbin Kim¹, Yonggun Park^{1,2}, Hwanmyeong Yeo^{1,2*}
¹서울대학교 산림과학부, ²서울대학교 농업생명과학연구원, ³국립산림과학원 목재이용연구부
¹Department of Forest Sciences, Seoul National University
²Research Institute of Agriculture and Life Sciences, Seoul National University
³Forest Products Department, National Institute of Forest Science
- P-16* **한국산 소나무 원목의 천연 건조 특성 (2)**
The Natural Drying Characteristics of *Pinus densiflora* in Korea (2)
 김지열, 김병로
 Jiyeol Kim, Byungro Kim
 충북대학교 임산공학전공
 Department of Forest Products and Engineering, Chungbuk National University, Korea

Session B : Wood Physics & Drying (목재물리, 목재건조)

P-17* **침엽수 3종의 방사방향 투습성능에 따른 Bio Dryer의 목재건조효과에 관한 연구**
A study on the change of Oak tree species moisture content and internal humidity according to temperature variation in the chamber made of softwood species

김준호, 강석구

Joon Ho Kim, Seog Goo Kang

충남대학교 농업생명과학대학 환경소재공학과 복합재료 연구실

Department of Bio-based Materials, Chungnam National University, Daejeon 34134, Korea

P-18 **포화증기 및 과열증기를 이용한 원목 건조 중 목재 내부 응력 예측**
Prediction of Drying Stress in Log during Saturated and Superheated Steam Drying

박용건^{1,2}, 양상윤^{1,2}, 정현우¹, 김현빈¹, 여환명^{1,2*}

Yonggun Park^{1,2}, Sang-Yun Yang^{1,2}, Hyunwoo Chung¹, Hyunbin Kim¹, Hwanmyeong Yeo^{1,2*}

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¹Department of Forest Sciences, Seoul National University

²Research Institute of Agriculture and Life Sciences, Seoul National University

Session C : Timber Engineering (목구조)

P-19 **국산 소경각재와 합판으로 제조된 다중접합 CLT 바닥판의 단기 휨 성능**
Short-term bending properties of multi-ply CLT floor panels made of domestic small square timber and plywood

장상식, 이형우

Sang Sik Jang, Hyoung Woo Lee

충남대학교 환경소재공학과

Department of Bio-based Materials, Chungnam National University, Korea

P-20 **국산 소경각재와 합판으로 제조된 다중접합 CLT와 콘크리트로 구성된 하이브리드 바닥판의 단기 휨 성능**
Short-term bending properties of hybrid floor structures composed of multi-ply CLT made of domestic small square timber and plywood, and concrete

장상식, 강수석

Sang Sik Jang, Soosuk Kang

충남대학교 환경소재공학과

Department of Bio-based Materials, Chungnam National University, Korea

P-21 **국산 소경각재와 합판으로 제조된 다중접합 CLT 바닥구조 및 지붕구조의 장기 휨 성능**
Long-term bending properties of multi-ply CLT floor and roof structures made of domestic small square timber and plywood

장상식, 유지은

Sang Sik Jang, Ji Eun Yoo

충남대학교 환경소재공학과

Department of Bio-based Materials, Chungnam National University, Korea

P-22 **국산 소경각재와 합판으로 제조된 다중접합 CLT와 콘크리트로 구성된 하이브리드 바닥판의 장기 휨 성능**
Long-term bending properties of hybrid floor structures composed of multi-ply CLT made of domestic small square timber and plywood, and concrete

장상식, 박정호

Sang Sik Jang, Jung Ho Park

충남대학교 환경소재공학과

Department of Bio-based Materials, Chungnam National University, Korea

P-23 **철물접합부의 야외 폭로에 따른 성능 변화**
Performance variation of metal-plate connections due to outdoor exposure

김광철

Gwang-Chul Kim

전북대학교 주거환경학과

Dept. of Housing Environmental Design, Chonbuk National University, Korea

P-24 **고건축물 안전진단 예측을 위한 야외폭로목재의 성능평가**
Performance evaluation of the outdoor exposed wood to predict the safety inspection of ancient buildings

김광철, 김준호

Gwang-Chul Kim, Jun-Ho Kim

전북대학교 주거환경학과

Dept. of Housing Environmental Design, Chonbuk National University, Korea

Session C : Timber Engineering (목구조)

- P-25 **차도포장용 고성능 우드블록의 내구성 실험**
Durability of high performance WPC block paver for basic rest area
양성철¹, 정찬욱², 정주현², 연송이², 김윤희², 최성규²
Yang, Sungchul¹, Jung, Chanwook², Jung, Joohyun², Yeon, Songee², Kim, Yunhee², Choi, Sunggyu²
¹Architectural Eng. School, Hongik Univ., ²Shinwha Co, Ltd
- 온·습도 변동에 따른 FRP보강적층재의 크리프 변형 거동(I)
P-26* **Creep behavior of FRP Reinforced Timbers under changing Temperature and relative humidity(I)**
이인환, 송다빈, 송요진, 홍순일
Inhwan Lee, Yojin Song, Dabin Song, Soonil Hong
강원대학교 산림바이오소재공학전공
Division of Forest Biomaterials Engineering, Kangwon National University
- 철근 및 FRP 보강 소경각재의 휨 성능 평가
P-27* **Bending Performance Evaluation of Composite Larch Timber Reinforced with Steel bar and FRP**
이인환, 송다빈, 송요진, 홍순일
Inhwan Lee, Yojin Song, Dabin Song, Soonil Hong
강원대학교 산림바이오소재공학전공
Division of Forest Biomaterials Engineering, Kangwon National University
- 생태건축자재로서 구조용 CLT 인증과 설계기법
P-28 **Structural design method and certification of cross-laminated timber (CLT) for ecological building material**
방성준¹, 이현정², 박금성³, 김현수³, 오정권^{1,2}
Sung-Jun Pang¹, Hyeon-Jeong Lee², Keum-Sung Park³, Hyun Soo Kim³, Jung-Kwon Oh^{1,2}
¹서울대학교 농업생명과학연구원, ²서울대학교 산림과학부, ³한국건설기술연구원 국민생활연구본부
¹Research Institute of Agriculture and Life Sciences, Seoul National University, Republic of Korea
²Department of Forest Sciences, Seoul National University, Republic of Korea
³Department of Living and Built Environment Research, Korea Institute of Civil Engineering and Building Technology, Republic of Korea
- 낙엽송 CLT 전단벽체의 반복전단시험
P-29 **Cyclic lateral test of Larix CLT shear wall system**
김건호, 김철기, 이수혁, 박태경
Keonho Kim, Cheolgi Kim, Soohyuk Lee, Taekyoung Park
국립산림과학원 목조건축연구과
Timber Engineering Division, National Institute of Forest Science, Korea

Session C : Timber Engineering (목구조)

- P-30 **Evaluating the difference of shear strength in stress direction of glued-laminated timber**
Kenji Aoki, Akihiko Miyake, Hiro KAWAHARA, Masahiro INAYAMA
Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences,
The University of Tokyo
- P-31* **Experimental Study of Partial Compressive Strength to Lateral Face of CLT**
Marina Totsuka, Kenji Aoki and Masahiro Inayama
Grad. School of Agric. and Life Sci., The University of Tokyo, Japan

Session D : Wood Material (목질재료)

- P-32 **심재부와 변재부의 공극형태에 따른 함량 측정**
Measurement of Content of Heartwood and Sapwood by Pore Types
 장은석, 강춘원
 Eun-suk Jang, Chun-won Kang
 전북대학교 주거환경학과
 Department of Housing Environmental Design, College of Human Ecology, Chonbuk National University
- P-33 **국내산 낙엽송 CLT의 바닥충격음 평가**
Evaluation of impact sound of CLT floor panels composed of larch square timber core and plywood cross band
 강춘원¹, 장은석¹, 조석운¹, 박희준¹, 장상식², 강효양²
 Chun Won Kang¹, EunSuk Jang¹, SukUn Cho¹, HeeJun Park¹, SangSik Jang², HoYang Kang²
¹전북대학교 주거환경학과, ²충남대학교 임산공학과
¹Department of Housing Environmental Design, Chonbuk National University
²Department of Wood Science Technology, Chungnam National University
- P-34* **난연 처리 목재-마그네슘 적층 복합재의 난연 성능**
Flame retardant performance of wood-magnesium laminated composite treated with flame retardant chemicals
 조석운, 박희준
 Seok-un Jo, Hee-jun Park
 전북대학교 주거환경학과
 Department of Housing environmental design, College of Human Ecology, Chonbuk National University, Korea
- P-35 **pH가 TEMPO 산화된 다크나무 인피섬유의 나노섬유화에 미치는 영향**
Effects of pH on nanofibrillation of TEMPO-oxidized paper mulberry bast fibers
 박정윤¹, 박찬우², 한송이², 권구중¹, 김남훈², 이승환²
 Jungyoon Park¹, Chanwoo Park², Songyi Han², Gujoong Kwon¹, Namhun Kim², Seunghwan Lee²
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²Department of Forest Biomaterials Engineering, College of Forest and Environmental Sciences, Kangwon National University, Chuncheon-Si, 24341, Korea
- P-36 **과초산처리를 통해 제조된 나노셀룰로오스 스펙폴드의 특성 평가**
Characterization of nanocellulose scaffold prepared by peracetic treatment
 이은아, 박지수, 박찬우, 한송이, 박정윤, 권구중, 이승환
 Eun Ah Lee, Ji Soo Park, Chan-Woo Park, Song-Yi Han, Jung-Yoon Park, Gu-Joong Kwon, Seung-Hwan Lee
 강원대학교 산림환경과학대학
 College of Forest and Environmental Sciences, Kangwon National University, Republic of Korea

Session D : Wood Material (목질재료)

- P-37* **Properties of Cold-Setting Melamine-Urea-Formaldehyde Resin Adhesives**
 Minseok Kim, Byung-Dae Park*
 Department of Wood and Paper Sciences, Kyungpook National University, Daegu, 41566, Republic of Korea
- P-38* **Bond-Line Features of Melamine-Urea-Formaldehyde Resin Adhesives in Plywood**
 Muhammad Adly Rahandi Lubis, Bora Jeong, Byung-Dae Park*
 Department of Wood and Paper Sciences, Kyungpook National University, Daegu, 41566, Republic of Korea
- P-39* **Effect of EPDM-g-MAH on the Performances of 3D-Printed PLA/Clay/Wood Nanocomposites by Fused Deposition Modeling**
 Young-Rok Seo¹, Sang-U Bae¹, Min Lee², Sang-Min Lee², Birm-June Kim^{1*}
¹Department of Forest Products and Biotechnology, Kookmin University
²Wood Processing Division, National Institute of Forest Science
- P-40* **A Study on the Thermal Properties of PLA/EPDM-g-MAH/Clay/Wood Nanocomposites**
 Young-Rok Seo¹, Sang-U Bae¹, Birm-June Kim^{1*}
¹Department of Forest Products and Biotechnology, Kookmin University
- P-41* **Effect of Nanoclay and Glass Fiber on the Water Absorption and X-Ray Diffraction Properties of Recycled WPCs**
 Young-Rok Seo¹, Sang-U Bae¹, Jae-Gyoung Gwon², Sun-Young Lee², Birm-June Kim^{1*}
¹Department of Forest Products and Biotechnology, Kookmin University
²Wood Chemistry Division, National Institute of Forest Science
- P-42* **A Study on the Mechanical and Morphological Properties of Nanoclay and Carbon Fiber Reinforced Recycled WPCs**
 Young-Rok Seo¹, Sang-U Bae¹, Jae-Gyoung Gwon², Sun-Young Lee², Birm-June Kim^{1*}
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- P-43* **A Study on the Thermal Properties of Nanoclay and Carbon Fiber Reinforced Recycled WPCs**
 Young-Rok Seo¹, Sang-U Bae¹, Jae-Gyoung Gwon², Sun-Young Lee², Birm-June Kim^{1*}
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Session D : Wood Material (목질재료)

- P-44* **Effect of Nanoclay and Carbon Fiber on the Water Absorption and X-Ray Diffraction Properties of Recycled WPCs**
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¹Department of Forest Products and Biotechnology, Kookmin University
²Wood Chemistry Division, National Institute of Forest Science
- P-45* **Accelerated Weathering of Virgin WPC/Waste WPC: Mechanical and Morphological Properties**
Sang-U Bae¹, Young-Rok Seo¹, Jae-Gyoung Gwon², Sun-Young Lee², Birm-June Kim^{1*}
¹Department of Forest Products and Biotechnology, Kookmin University
²Wood Chemistry Division, National Institute of Forest Science
- P-46* **Accelerated Weathering of Virgin WPC/Waste WPC: Visual Appearance, Chemical Change, and Water Absorption**
Sang-U Bae¹, Young-Rok Seo¹, Jae-Gyoung Gwon², Sun-Young Lee², Birm-June Kim^{1*}
¹Department of Forest Products and Biotechnology, Kookmin University
²Wood Chemistry Division, National Institute of Forest Science
- P-47* **Effect of Wood Content on Mechanical Properties and Microstructures of 3D Printed Composites fabricated with FDM**
Sang-U Bae¹, Young-Rok Seo¹, Min Lee², Sang-Min Lee², Birm-June Kim^{1*}
¹Department of Forest Products and Biotechnology, Kookmin University
²Wood Processing Division, National Institute of Forest Science
- P-48* **폐MDF 재생섬유의 염색특성에 미치는 반응성염료계의 염색조건**
Dyeing properties of reaction dyes for regenerated wood fiber from waste MDF by dyeing conditions
 주선경, 노정관
Seong-Gyeong Ju, JeongKwan Roh
 경남과학기술대학교 건설환경공과대학 인테리어재료공학과,
 Department of Interior Materials Engineering, Gyeongnam National University of Science Technology
- P-49 **요소의 첨가방법에 따른 UMF수지의 합성조건 최적화**
Optimization of Synthesis Condition of UMF Resin by Different Addition Methods of Urea
 강은창 · 이 민 · 이상민
Eunchang Kang, Min Lee, Sang-Min Lee
 국립산림과학원
 National Institute of Forest Science, Korea

Session D : Wood Material (목질재료)

- P-50 **전분접착제로 제조한 파티클보드의 성능**
Performance of particle board made by starch adhesive
 이상민, 강은창, 이민
Sang-Min Lee, Eun-Chang Kang, Min Lee
 국립산림과학원 목재이용연구부 목재가공연구과
 National Institute of Forest Science Forest Products Department Wood Processing Division
- P-51 **목섬유 단열재의 최적 제조 조건 구명**
Manufacture of wood-fiber insulation board
 이민, 이상민, 장재혁, 강은창
Min Lee, Sang-Min Lee, Jae-hyuk Jang, Eun-Chang Kang
 국립산림과학원 목재이용연구부 목재가공연구과
 National Institute of Forest Science Forest Products Department Wood Processing Division
- P-52 **목섬유 단열재의 화재 안전성**
Fire performance of wood-fiber insulation board
 이민, 이상민, 장재혁, 강은창
Min Lee, Sang-Min Lee, Jae-hyuk Jang, Eun-Chang Kang
 국립산림과학원 목재이용연구부 목재가공연구과
 National Institute of Forest Science Forest Products Department Wood Processing Division
- P-53 **Physical and Mechanical Properties Of Hybrid Bamboo Oriented Strand Board**
Fauzi Febrianto^{1*}, Sena Maulana^{1,4}, Muhammad Iqbal Maulana¹, Marwanto¹, Soleh Muhammad¹, Rika Kartika Sari¹, Wahyu Hidayat², Nam Hun Kim³
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- P-54 **Destructive and Non-destructive Tests of Bamboo Oriented Strand Board under Various Shelling Ratio and Resin Content**
 Sena Maulana^{1,5}, Muhammad Iqbal Maulana¹, Marwanto¹, Yuarsa Gumelar¹, Wahyu Hidayat², Nyoman Jaya Wistara¹, Ihak Sumardi³, Fauzi Febrianto^{1*}, Nam Hun Kim⁴
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Session D : Wood Material (목질재료)

P-55 **Surface Modification of Kapok and Balsa Fiber Induced by Corona Plasma Radiation for Natural Fiber Composite**

Fauzi Febrianto¹, Renny Purnawati¹, Marwanto¹, Muhammad Iqbal Maulana¹, Nyoman Jaya Wistara¹, Siti Nikmatin^{2,3}, Wahyu Hidayat⁴, Nam Hun Kim⁵
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³Surfactant and Bioenergy Research Center, Bogor Agricultural University, Indonesia
⁴Department of Forestry, Faculty of Agriculture, Lampung University, Indonesia
⁵College of Forest and Environmental Sciences, Kangwon National University, Korea

P-56 **Comparative studies of air-coupled ultrasonic and X-ray computed tomography for nondestructive evaluation in fire-retardant wood**

Masumi Hasegawa¹, Hiroyuki Okamura², Mami Murakawa³, Kazutoshi Takeuchi², Keiichi Yamada⁴, Kiyotaka Uchikura⁵, Noriyuki Harada⁵, Junji Matsumura¹
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³School of Agriculture, Kyushu University, ⁴Mechanics and Electronics Research Institute, Fukuoka Industrial Technology Center, ⁵Kyushu Mokuzai Kougyo Co., Ltd.

Session E : Wood Preservation (목재보존)

P-57 **목재의 지속가능한 이용에 관한 법률이 목재보존산업에 미치는 영향**
The impact of the law on the sustainable use of wood on the wood preservation industry

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P-58 **8년차 야외시험을 통한 방부처리된 난주입수종의 방부효능 평가**
Evaluation of the preservation efficacy of refractory species after 8 years of field testing

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P-59* **충청북도 목조건화재 모니터링 사례 분석**
Analysis of Monitoring of Wooden Cultural Properties in Chungcheongbuk-do

김찬교, 한규성
Chan Gyo Kim, Gyu-Seong Han
충북대학교 대학원 문화재과학과
Department of Cultural Heritage Science, Graduate School, Chungbuk National University

P-60 **레이저 인사이징을 이용한 난연 목재 제조**
Manufacture of Flame Retardant Wood Using Laser Incising

박정은, 윤세민, 황원중, 최용석, 손동원
Jung-Eun Park, Sae-Min Yoon, Won-Joung Hwang, Yong-Seok Choi, Dong Won Son
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P-61 **난연 처리 목재의 가스독성과 ICP 분석**
Gas Toxicity and ICP Analysis of Flame Retardant Wood

박정은, 윤세민, 황원중, 최용석, 손동원
Jung-Eun Park, Sae-Min Yoon, Won-Joung Hwang, Yong-Seok Choi, Dong Won Son
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P-62 **도포형 흰개미 방제 약제 개발 I - 1차 개발약제의 방부·방의(흰개미) 효력 평가**
Development of a couated termite control agent I - Evaluating the 1st developed agent on the Decay and Termite resistance of wood

윤세민, 박정은, 황원중, 최용석, 손동원
Sae-Min Yoon, Jung-Eun Park, Won-Joung Hwang, Young-Seok Choi, Dong-Won Son
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<전시-P-54>

Destructive and Non-destructive Tests of Bamboo Oriented Strand Board under Various Shelling Ratio and Resin Content

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Wahyu Hidayat², Nyoman Jaya Wistara¹, Ihak Sumardi³, Fauzi Febrianto^{1*}, Nam Hun Kim⁴

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The objective of this study was to evaluate the properties of bamboo oriented strand board (BOSB) from betung (*Dendrocalamus asper*) bamboo using destructive and non-destructive methods under various shelling ratio and resin content. Strands were vacuum-treated at 126 °C for 1 h under 0.14 MPa pressure and followed by washing with 1% NaOH solution. Three-layer BOSB (face:core:back) layers with the core layer perpendicular to the surface was formed with 15:70:15; 20:60:20; 25:50:25; 30:40:30 weight ratio and binded with 7 and 8% of phenol formaldehyde (PF) resin with the addition of 1% of wax. The evaluation of physical and mechanical properties of the boards was conducted in accordance with the JIS A 5908:2003 standard and compared with CSA 0437.0 standard for commercial OSB (Grade O-1). The results showed that BOSBs manufactured using 8% resin content with various core-to-face layer ratios had better physical and mechanical properties than using 7% resin content. Increasing core layer ratio increased the strength of BOSBs parallel to the grain. The face:core:back layers ratio of 25:50:25 could be used as a simple way to reduce PF resin requirements from 8% to 7%. Testing of non-destructive mechanical properties in betung BOSB has a high correlation with destructive testing.

Keywords: bamboo, *Dendrocalamus asper*, bamboo oriented strand board, resin content, shelling ratio

<전시-P-55>

Surface Modification of Kapok and Balsa Fiber Induced by Corona Plasma Radiation for Natural Fiber Composite

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The interest in using natural fibers as reinforcing element in composite materials based on polymeric matrices is constantly using, mainly because of the many advantages associated with this renewable material. This study was carried out to investigate effect corona plasma radiation to kapok and balsa fiber in natural fiber composite with polypropylene matrices. The corona plasma radiations incandescent using a high voltage DC (0-4) Kv by observing a current value of 0.5 mA and an output voltage of 14 kV in atmospheric pressure. Field-point electrodes come from PCB fiber size 15x15 cm. The point electrode uses 100 stainless steel needles measuring 0.5 mm and 1.6 cm long. The distance between the electrode points and fields is 18 mm and the radiation time variation is 10, 20 and 30 minutes. Results show that Corona plasma radiations treatment with 20 minutes and 30 minutes are increase crystallinity index and surfaces wettability fibers than fibers untreated. Tensile strength and modulus of elasticity natural composite are increase in 10, 20, and 30 minutes radiations thus being appropriate for technical applications.

Key words: Corona plasma radiation, kapok, balsa, crystallinity index, surface wettability, tensile strength.