

Chair

2.2.17 Laboratory : Laboratory of Sustainable Materials

Member:	Professor	Kawai, Shuichi , Dr. Agric. Sci.
	Associate Professor	Umemura, Kenji, Dr. Agric. Sci.
	KU Visiting Professor	Zhang Min, Dr. Agric. Sci.
	Doctor's program	3
	Master's Program	4
	Post-Doctoral fellow	2

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Development of sustainable materials from plant fibers

High-strength plant fiber composites have been developed. For an example, kenaf is a fast growing annual plant. The bast fiber with extreme high strength is converted into kenaf-oriented fiberboard.

In addition, kenaf core is lightweight and is rich in hemicelluloses. Based on these properties, we are trying to develop a self-bonding board.

b) Development of new wood-based materials using non-fossil resources

Wood-based materials consist of wood elements and adhesives. We are researching new natural wood adhesives and new materials glued with organic components derived from animal and plant. The goal is to develop environmentally friendly wood-based materials.

c) Material flow analysis of wood biomass

The increase of carbon dioxide in the atmosphere has contributed to the global warming. We are trying to evaluate the carbon flow of wood biomass by macro-analysis relating to photosynthesis, utilization of wood and bio-degradation.

The sustainable system of production and utilization of wood biomass is being investigated.

d) Aging of wood and prediction of service life of wood

Changes of physical, chemical and mechanical properties on aged wood have been investigated and the mechanism of wood aging has been discussed by being compared with those of thermal treated wood. For an example, kinetic analysis is successfully applied to wood color properties which implied that color change during natural aging and heat treatment can be explained as the similar reaction.

A-2.Publications and presentations

a) Publications

Books

- Kawai S: Sugihara K: Kono Y: Tanabe A: Tanaka K: Kosugi Y: Kozan O: Kanzaki M: Yamada A: Son S: Hoshikawa K: Fujita M: Ishikawa N: Watanabe T: Shimizu N: Kimura S: Sato T: Wada T: Chapter 7 The Creation of Tropical Forest Biosphere, "Geosphere, Biosphere and Humanities- In Search of the Sustainable Humanosphere- Sugihara K, Kawai S, Kono Y and Tanabe A ed. Kyoto University Press, p.215-231, 2010

- Kawai S: 50 LVL(2)—Type, Performance, Utilization-, 52 Particleboard and Fiberboard, 53. Structural Composites and their Production technology, 54. Other Composite Products and Utilization of Non-wood Lignocellulosics, "Concise Book on Wood Products", ed. Institute of Wood Technology, Akita Prefectural University, p.104-113, 2011.

Original Papers(including book-reviews)

- Kenji Umemura, Ayako Mihara, Shuichi Kawai: Development of new natural polymer-based wood adhesives III. Effects of glucose addition on properties of chitosan. J. Wood Sci., 56(5), 387-394 (2010)

- Hidefumi Yamauchi, Kenji Umemura: Physical properties of particleboard made from wooden waste after outdoor exposure test. Mokuzai Gakkaishi, 56(6), 405-411 (2010)

- Miyuki Matsuo, Misao Yokoyama, Kenji Umemura, Junji Sugiyama, Shuichi Kawai, Joseph Gril, Shigeru Kubodera, Takumi Mitsutani, Hiromasa Ozaki, Minoru Sakamoto, Mineo Imamura: Aging of wood - Analysis of color changes during natural aging and heat treatment-, Holzforschung 65 (3): 361-368 (2011)

Reviews

- Kenji Umemura: Development of wood-based materials bonded with citric acid, Plastics, 61(2), 62-64 (2010)

- Kenji Umemura: Utilization of citric acid as a wood adhesive, Biological Resources, 4(1), 8-13 (2010)

- Kenji Umemura: Wood adhesive using citric acid, Journal of Timber Engineering, 24(1), 11-16 (2011)

- Kawai S; Tsujino Y, Fujita S, Yamamoto G; : Removal of air pollutants and Controll of Humidity by wood, Clean technology, 1-4 (2010)

Reports,others

- Umemura K., Mihara A., Kawai S.: Improvement of adhesion properties of chitosan by glucose addition, XXIII IUFRO World Congress (Seoul, Korea), The international forestry review 12(5), 277 (2010)

- Munawar S., Kawai S., Umemura K.: Properties of molded products from Acacia mangium bark and malic acid, XXIII IUFRO World Congress (Seoul, Korea), The international forestry review 12(5), 276 (2010)

- Matsuo M., Yokoyama M., Umemura K., Kawai S.: Color changes in wood, paper and their components during natural aging and heat treatment, XXIII IUFRO World Congress (Seoul, Korea), The international forestry review 12(5), 437 (2010)

- Miyuki Matsuo, Joseph Gril, Misao Yokoyama, Kenji Umemura, Shuichi Kawai: Modelling of colour change induced by aging and heat treatment by using the multi-process kinetic analysis, COST Action FP0904 Workshop "Mechano-chemical transformation of wood during THM processing" (Biel, Switzerland), Book of Abstracts p.123-124 (2010)

- Azuma K, Kouda K, Nakamura M, Fujita S, Tsujino Y, Uebori M, Kusaki J, Inoue S, Kawai S: Effects of Emissions from Cedar Timber on Psychological and Physiological Factors in Indoor Environment. 2010 Joint Conference of International Society of Exposure Science & International Society for Environmental Epidemiology, Seoul, Korea. 2010.

- Kawai Shuichi, Matsumoto yoshikatsu, Yutaka Yoshida and Yutaka Sato: Forest Biomass Production of Plantation Forest in Sabah, Malaysia, A03-P04, XXIII IUFRO World Congress, 23-26 August 2010, Seoul, Korea

- Shuichi Kawai: Biomass assessment and management in a tropical peatland ecosystem, International Seminar "Scientific Exploration and Sustainable Management of Bioresources in Tropical Peatland Ecosystems" G-COE & Riau University, 20 October 2010, Pekanbaru, Indonesia

b) Conference and seminar papers presented

- XXIII IUFRO World Congress, 2010. 3 presentations

- COST Action FP0904 Workshop "Mechano-chemical transformation of wood during THM processing" 1 presentations

- The 31th Symposium on wood adhesion: 1 presentation

- The 61th Annual Meetings of the Japan Wood Research Society: 10 presentations

- The 28th Annual Meetings of the Wood Technological Association in Japan: 1 presentation

- The 48th Symposium on Adhesion: 1 presentation

- The 32th Annual Meetings of Japan Society for the Conservation of Cultural Property: 1 presentation

- Special Forum of Environmental Measurement & Assessment, Japan Healthy House Association: 1 presentation

- The 16th workshop on Sustainable Wood Technology, Consortium of The National Institute of Advanced Industrial Science and Technology: 1 presentation

- The 51th Annual Meetings of Japan Society for Atmospheric Environment: 1 presentation

A-3.Off-campus activities 1

Membership in academic societies

- awai, Shuichi D.Agric.Sci : The Japan Wood Research Society (Member of directors board), The Society of Materials Science, Japan (Members of the Committees of Wood Composite materials and Referee), The Japanese Forest Society, The Wood Technological Association of Japan (Member of directors board), The Japan Wood Preserving Association, The Adhesion Society of Japan

- Umemura, Kenji, Dr. Agric. Sci. : The Wood Technological Association of Japan (Member of planning committee and officer of the Kansai Branch, Member of officer of the Plywood Section, Member of advisory committee of the WPC Section), The Japan Wood Research Society (Member of Annual Meeting Board), The Adhesion Society of Japan (Member of Editorial Board), The Society of Materials Science, Japan (Referee)

Membership in Science Council of Japan, etc.

- Kawai, Shuichi D.Agric.Sci : The Science Council of Japan (Associate Member), The Forest, Wood and Environment Academy (Member of Director Board, Member of Steering Committee)

A-3.Off-campus activities 2

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Grants-in-Aid for Scientific Research (A): : Shuichi Kawai : Database of properties on the members from historical wooden buildings.

- Grants-in-Aid for Scientific Research (B) : Suzuki Shigehiko : Evaluation of the durability of wood based panels from outdoor exposure

- Grants-in-Aid for Scientific Research© : Umemura Kenji : Development of high-performance adhesive without using fossil resources

- Global COE Program : Sugihara Kaoru : In Search of Sustainable Humansphere in Africa and Asia

- Grant-in-aid for Scientific Research : Kozan Osamu : Impact Assessment of Large-scale Plantation Forest in Peat Swamp area

2. Other Research Grants

- Grants-in-Aid from Tostem Buildign material Industry Funding : Kawai Shuichi : Fundamental and applied research on air purification of sugi timber.

- Funded by Special Coordination Funds for Promoting Science and Technology (SCF) Program, Japan Science and Technology Agency, Ministry of Education, Science, Culture and Sports : Kenzaki Mamoru : Creation of the paradigm of sustainable use of tropical rainforest by the intensive forest management and advanced utilization of forest resources

A-4. International cooperation and overseas activities 1

Membership in academic societies

- awai Shuichi: International Academy of Wood Science (Fellow)

International meetings(country,roles)

- Kawai Shuichi : Japan-Indonesia Workshop for Sustainable Development of Tropical Forests:Organizer, International Seminar "Scientific Exploration and Sustainable Management of Bioresources in Tropical Peatland Ecosystems" G-COE & Riau University :Lecturer

International joint research, overseas research surveys

- Evaluation of biomass growth in acacia plantation forest in South Sumatra, Kawai Shuichi, (Indonesia)

- Research and Development for Non-wood Lignocellulosic Materials (China)

- Evaluation of biomass growth in acacia hybrid plantation forest in Kalimantan, Kawai Shuichi, (Malaysia)

- Investigation of the vegetation and biomass in Riau Biosphere, Kawai Shuichi , (Indonesia)

- Research survey of wood industries using Acacia mangium and Oil Palm wood, Umemura Kenji, (Malaysia)

A-4.International cooperation and overseas activities 2

Visiting Research Scholars

- Guest Scholar 1 (China)

- Guest Research Associate 2 (Indonesia)

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : Wood Composites (Kawai, Yano),
Science for Sustainable Humanosphere (Kawai)

- Graduate level : Seminar in Sustainable Materials (Kawai, Umemura).
Laboratory Course of Sustainable Materials (Kawai, Umemura).
Sustainable Materials I (Kawai)
Lecture of Kyoto Sustainable Initiative (Kawai)

B-2.Off-campus teaching etc.

Open lectures, etc.

- Kawai Shuichi: Seminar of the Japan 2x4 Housing association, Kansai branch; Lecturer

- Kawai Shuichi: Seminar on Considering the Educational Environment for Children in Minoo city, Osaka (Lecturer)

- Kawai Shuichi: Seminar of the Osaka Forest Industry Association (Lecturer)

- Kawai Shuichi: Seminar of Iki-Iki Forest network (Lecturer)

- Kawai Shuichi: Seminar of RISH Open Symposium (Lecturer)

- Kawai Shuichi: Seminar of the Japan Wood Machinery Association (Coordinator, Lecturer)

- Kawai Shuichi: Seminar of Public Buildings, Ministry of land, Infrastructure, Transport and Tourism (lecturer)

- Kawai Shuichi: Humanosphere Forum, RISH (Lecturer)

- Kawai Shuichi: Seminar of Wakayama Environment Symposium, Wakayama Prefecture (Lecturer)

B-3.Overseas teaching 1

International students

- International students : Doctoral 1 (Indonesia)

C.Other Remarks

- Kawai Shuichi : Councilor of Forest Management of Kyoto Prefecture, Adviser of Okayama Pref. Wood Technology Center, Sub-committee member of JSPS Grant-in-Aid Committee, Vice-President of Kyoto University, Part-time Researcher of Architectural Research Association