Chair Biomaterials Function

2.2.12 Laboratory : Chemistry of Biomaterials

Member :	Professor	Takano, Toshiyuki, Dr. Agric. Sci.
	Assistant Professor	Kamitakahara, Hiroshi, Dr. Agric. Sci.
	Doctor's program	3
	Master's Program	8
	Undergraduate	3
	Program-Specific Researcher	3

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Chemical syntheses of oligo- and polysaccharides and their function

Research in our laboratory encompasses the development of photo-current cellulosic materials for a new artificial photosynthesis system, the synthesis of reducing end modified cellulose derivative and its properties, the syntheses of regio-substituted cellulose, oligosaccharides and their surfactant abilities, the preparation of enzyme immobilized amino-cellulose and its properties, immobilization of tannin component to cellulose.

b) Reactivity of lignin

The elucidation of peculiar behavior of sinapyl alcohol in the dehydrogenative polymerization (lignin formation) using γ-substituted monolignol derivatives, and the synthesis of biomimetic catalyst based on cellulose-porphyrin derivatives for monolignol polymerization are currently being investigated to obtain fundamental knowledge of the dehydrogenative polymerization of lignin. The electronic oxidation of lignin model compounds for pretreatment of Kraft pulping, the development of new analysis method for lignin main linkage (β-O-4) are also being investigated.

c) Chemical syntheses of the extractive and their utilization

Other targets of current interest include preparation of hydorolysed-tannin. We are developing a new functional synthetic polymer with galloyl group as a pendent group. Our research focuses on extractives of tropical plants as well.

d) Chemical modification of wood

A chemical modification method of wood using super-critical carbon dioxide as a green process is also being investigated.

A-2.Publications and presentations

a) Publications

Original Papers(including book-reviews)

- Sakakibara, Keita; Takano, Toshiyuki; Nakatsubo, Fumiaki. Synthesis of methylcellulose model copolymers with heterogeneous distribution and their solution properties. Cellulose,18 (1), 105-115 (2011)

- Yuki Tobimatsu, Toshiyuki Takano, Hiroshi Kamitakahara, Fumiaki Nakatsubo. Reactivity of syringyl quinone methide intermediates in dehydrogenative polymerization I: high-yield production of synthetic lignins (DHPs) in horseradish peroxidase-catalyzed polymerization of sinapyl alcohol in the presence of nucleophilic reagents. J Wood Sci 56:233–241 (2010)

- Takashi Akagi, Yasuhiko Suzuki, Ayako Ikegami, Hiroshi Kamitakahara, Toshiyuki Takano, Fumiaki Nakatsubo and Keizo Yonemori: Condensed Tannin Composition Analysis in Persimmon (Diospyros kaki Thunb.) Fruit by Acid Catalysis in the Presence of Excess Phloroglucinol. J. Japan. Soc. Hort. Sci. 79 (3): 275–281 (2010)

- Yukiko Enomoto-Rogers, Hiroshi Kamitakahara, Arata Yoshinaga, and Toshiyuki Takano. Radially oriented cellulose triacetate chains on gold nanoparticles. Cellulose 17(5): 923-936 (2010)

- H. Kamitakahara, T. Funakoshi, S. Nakai, T. Takano, F. Nakatsubo. Synthesis and Structure/Property Relationships of Regioselective 2-O-, 3-O- and 6-O-Ethyl Celluloses. Macromolecular Bioscience, 10, 638-647 (2010)

Reviews

- Toshiyuki Takano, Prospect of lignin utilization research, Network Polymer 31, 213-223 (2010)

b) Conference and seminar papers presented

- The 17th Annual Meeting of the Cellulose Society of Japan Kagawa, 2010.7.15-7.16), 2 presentations

- The 61st Annual Meeting of the Japan Wood Research Society (Kyoto, 2011.3.18-3.20), 3 presentations

- The 55th Lignin Symposium (Kyoto, 2010.10.20-10.21) 2 presentations

- 241st ACS meeting (Anaheim, 2011.3.27-3.31) 1 invited lecture

- BIT's 1st Annual World Congress of NanoMedicine 2010 (Beijing, 2010.9.23-25) 1 invited lecture

- 25th International Carbohydrate Symposium (ICS2010) 1 presentation

- The Cellulose Society of Japan, Kansai Branch, Seminar for young scientist in Setouchi, 1 invited lecture

- The Cellulose Society of Japan, Kansai Branch, 16th Microsymposium, 1 invited lecture

A-3.Off-campus activities 1

Membership in academic societies

- oshiyuki Takano : The Japan Wood Research Society (Program committee, The 61th annual meeting committee), The Cellulose Society of Japan (Kansai branch committee)

- Hiroshi Kamitakahara : The Japan Wood Research Society (Secretary of Working group on Chemical and Biochemical Conversion of Biomass)

- Toshiyuki Takano : Secretary General of The 55th Lignin Symposium

Membership in Science Council of Japan, etc.

- Hiroshi Kamitakahara : Secretary of The 55th Lignin Symposium , Regional assistant member for The 61th Annual Meeting of the Japan Wood Research Society

A-3.Off-campus activities 2

Research grants

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

- Basic Research (C) : Takano, Toshiyuki : Biomimetic polymerization of phenol derivatives

- Basic Research (C) : Kamitakahara, Hiroshi : Precise synthesis of cellulosic block copolymers with novel functions based on their supramolecular structure

2.Other Research Grants

- Japan Science and Technology Agency, Special Coordination Funds for Promoting Science and Technology (SCF) Program：Mamoru Kanzaki（Kyoto U）、Toshiyuki Takano, Hiroshi Kamitakahara（Co-investigators）：Creation of the paradigm of sustainable use of tropical rainforest by the intensive forest management and advanced utilization of forest resources

- Health and Labour Sciences Research Grants for Research on Intractable Diseases from the Ministry of Health, Labour and Welfare, Japan：Katsumi Doh-ura（Tohoku U）、Hiroshi Kamitakahara（co-investigator）：Preclinical studies of prophylactic remedies for prion diseases

- JSPS Travel Grant for Academic Meetings：Hiroshi Kamitakahara：241st ACS meeting (Anaheim, 2011.3.27-3.31)

A-4.International cooperation and overseas activities 1

International meetings(country,roles)

- Kamitakahara, Hiroshi：BIT's 1st Annual World Congress of NanoMedicine 2010 (Beijing, China, Invited Lecture), 241st ACS National Meeting (Anaheim, USA, Invited Lecture)

International joint research, overseas research surveys

- Japan Science and Technology Agency, Special Coordination Funds for Promoting Science and Technology (SCF) Program

- Mamoru Kanzaki（Kyoto U）、Toshiyuki Takano, Hiroshi Kamitakahara（Co-investigators）

- Creation of the paradigm of sustainable use of tropical rainforest by the intensive forest management and advanced utilization of forest resources

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level：Basic Forest and Biomaterials Sciences II (Takano), Cellulose Chemistry (Takano), Biomass Chemistry (Takano), Outline of Agricultural Science II (Takano), Laboratory Course in Forest and Biomaterials Science II (Takano, Kamitakahara), Laboratory Course in the Basic Forest and Biomaterial Chemistry (Takano, Kamitakahara), Laboratory Course in Biomaterials Chemistry I (Takano, Kamitakahara), Practice in University Forest IV (Kamitkahara) Natural Environment of Cold Winter Period of East Hokkaido (Kamitakahara)

- Graduate level : Biomaterilas Chemistry II (Takano), Scientific writing and presentation in English (Kamitakahara), Seminar in Biomaterials Chemistry (Takano, Kamitakahara), Laboratory Course in Biomaterials Chemistry (Takano, Kamitakahara)

B-2.Off-campus teaching etc.

Open lectures, etc.

- Toshiyuki Takano: Open lectures (by Division of Forest & Biomaterials Science, Kyoto University) Lecturer