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Learning from Biomaterials

The Chemistry of Biomaterials
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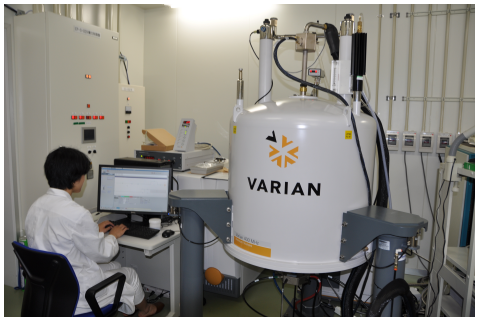
"Biomaterials" is a general term for natural organic materials produced by an organism for itself. The elucidation of their chemical structures and purpose of their production in nature gives a new basic idea for the development of new functional materials. We are studying their chemical structures and functions based on organic synthetic technique from the standpoint of "Learning from biomaterials!".

Structure analysis of biomaterials

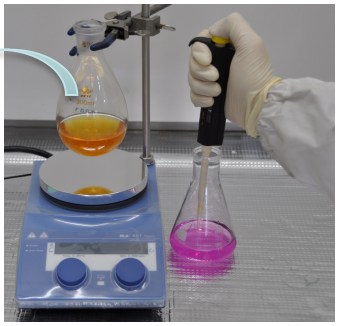
Lignin is one of the main components of wood and represents, after cellulose, the most abundant polymer in nature. Unfortunately, the elucidation of its chemical structure has not been finished. We are studying to develop a new isolation method, and a new chemical analysis technique. Recently, our research also addresses unknown compounds extracted from tropical forest products, particularly in Kalimantan, Indonesia.



Modern analytical instrument

Chemical synthesis of biomaterials

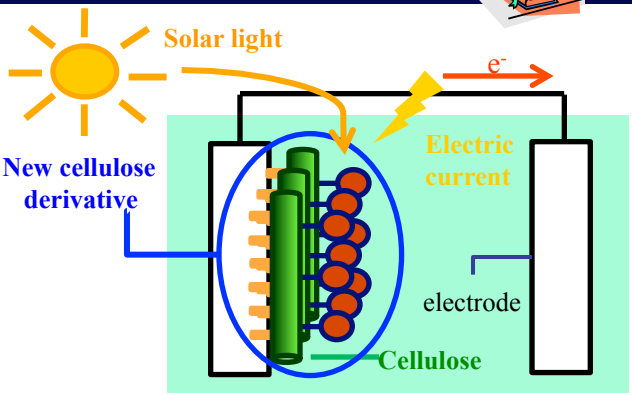
Design and synthesis of cellulose derivatives



Cellulose accounts for approximately 50% of wood, and is the most abundant polymer in nature. In 1996, we succeeded in the first chemical synthesis of cellulose. Currently we have particular interest in the synthesis of cellulose derivatives with regioselective and blocky functionalization patterns to explore their structure-property relationships.

Functionalization of biomaterials

We are actively engaged in developing an LB film of a new cellulose derivative and a new artificial photosynthesis system with the aim of application of cellulose at a nano-level. Our research focuses on the synthesis of polysaccharide derivatives with fascinating functions from sustainable biomaterials.



Key words

Biomaterials, Wood components、Cellulose、Lignin、Exractives、Tannin、Chemical analysis、Chemical modification wood, Organic synthesis、LB film, Artificial photosynthesis system, Wood chemistry

Recent publications

Lignin Functionalization through Chemical Demethylation: Preparation and Tannin-Like Properties of Demethylated Guaiacyl-Type Synthetic Lignins
Sawamura, K.; Tobimatsu, Y.; Kamitakahara, H.; Takano, T., (2017)
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TEMPO-mediated electro-oxidation reactions of non-phenolic β-O-4-type lignin model compounds
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Preparation of phthalocyanine-bound myristoyl celluloses for photocurrent generation system
Saito, Y.; Kamitakahara, H.; Takano, T., (2017)
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Factors affecting photocurrent generation performances of Langmuir-Blodgett films of tetraphenylporphyrin-bound acyl celluloses
Ogawa, Y.; Sakakibara, K.; Nakatsubo, F.; Kamitakahara, H.; Takano, T., (2016)
Cellulose, 23 (6), 3875-3883.

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Kamitakahara, H.; Suhara, R.; Yamagami, M.; Kawano, H.; Okanishi, R.; Asahi, T.; Takano, T., (2016)
Carbohydr. Polym., 151, 88-95.

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Nishida, S.; Shibano, M.; Kamitakahara, H.; Takano, T., (2015)
Int. J. Mol. Sci. 2015, 16 (12), 29093-29102.

Facile synthesis of acyl chitosan isothiocyanates and their application to porphyrin-appended chitosan derivative
Shibano, M.; Nishida, S.; Saito, Y.; Kamitakahara, H.; Takano, T., (2014)
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Ozawa, M.; Fukutome, A.; Sannami, Y.; Kamitakahara, H.; Takano, T., (2014)
J. Wood Chem. Technol., 34, 262-272.