L I G N O V I S I O N E N

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Band 2 / Issue 2

Holz:
Rohstoff – Werkstoff – Energiequelle der Zukunft

Wood:
Raw material – Material – Source of energie for the future

Holz ist der wichtigste nachhaltig verfügbare Massenrohstoff und das eröffnet ihm damit eine führende Rolle im Wettstreit der Werkstoffe. Durch die traditionelle Prägung des Holzes als Alltagswerkstoff werden die Zukunftsperspektiven des Holzes aber oft nicht erkannt. Der vorliegende Band 2 von LIGNOVISIONEN gibt das Fachsymposium „Holz – Rohstoff, Werkstoff, Energieträger der Zukunft" im Rahmen des Internationalen BOKU Kongresses 2001 „ Leben und Überleben – Strategien für die Zukunft" wieder.
Exemplarisch wird darin aufgezeigt, wie Holz zu einem der wichtigsten Werkstoffe für das Leben und Überleben der Menschheit wird.

Wood is the most important sustainable mass raw material available. As wood has always been a traditional material used in everyday life, we do not immediately realize its importance for the future. It was the target of the symposium „Wood – Raw Material and Source of Energy for the Future", which was organized within the International BOKU Congress „Life and Survival –Strategies for the Future", to point out the future importance of wood. The present issue 2 of LIGNOVISIONEN summarizes this symposium, where the potential of wood was demonstrated and selected innovative developments were discussed.

... mehr Information / more info:

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Holzchemie -
Wege zu einem besseren Verständnis des Biowerkstoffes Holz

von Barbara Hinterstoisser, Barbara Stefke und Manfred Schwanninger

Holz ist ein natürlicher, nachwachsender Rohstoff der ganz besonderen Art - ein Verbundwerkstoff, zusammengesetzt aus einer Vielzahl unterschiedlichster, chemischer Komponenten, die sich wesentlich in ihren Eigenschaften voneinander unterscheiden. Erst das Zusammenspiel der Komponenten gibt dem Holz seine spezifischen Eigenschaften. Holz ist nicht gleich Holz, keine neue Erkenntnis, aber durchaus nicht leicht zu erklären. Woher kommen die Unterschiede zwischen Nadel- und Laubholz, normalem Holz und Druckholz, Früh- und Spätholz? Wodurch werden sie beeinflußt? Wie und in welchem Maße wirkt sich der Standort auf die molekulare Struktur des Holzes aus und welche Auswirkung haben diese Unterschiede wiederum auf die mechanischen Eigenschaften des Holzes? Wie können wir die Nutzung dieses Biowerkstoffes optimieren? Können wir den Werkstoff für die Nutzung optimieren? Diese und viele andere mehr sind die Fragen, die die moderne Holzchemie zu beantworten sucht.

Wood Chemistry –
for a better understanding of the biomaterial

Wood is a natural renewable raw material, composed of various chemical components that characteristically differ in several properties. Wood's typical features are based on the interplay of these components.
Wood chemistry is not only to be seen as a science dealing with the components in particular. It is a science that uses the revealed knowledge about the component's properties to gain full comprehension of the natural biocomposite wood. The emphasis of wood chemistry is furthermore put on the chemical utilization of distinctive wood components and their modification to gain a new raw material. To answer appearing questions the cooperation of all chemical disciplines are required also including the growing importance of biotechnology. Moreover interdisciplinary cooperation with all wood research disciplines is of high importance to push ahead wood chemical research successfully.
The "modification of lignocellulosic materials" is realized in area 1 of the **"**competence center WOOD**"**, which started in 2001. The projects of area 1 are coordinated and partly carried out at the Institute of Chemistry (BOKU) in close cooperation with the Institute of Food Technology (BOKU), the Institute of Meteorology and Physics (BOKU) and the Institute of Biochemical Technology and Microbiology (TU Vienna).
The research work done within the competence center is financed partly by the cooperating companies (40 %) and by official support (60 %). The founding initiative of WOOD was made by OMV under participation of the companies Fritz Egger GmbH & Co, Agrolinz Melamin GmbH, Funder Industrie GmbH, Dynea Austria GmbH, Lenzing AG and the forum for forest, board and paper.
Area 1 in particular deals with different possibilities of modifying the wooden raw material to gain high quality wood composites that are adapted to new fields of application. Acetylation as one example out of several chemical methods of modification (performed at the Institute of Chemistry, BOKU), leads to significant changes of distinct wood properties: An improvement of the dimensional stability of wood can be obtained as well as an increase of biological stability. Specific enzymatic treatment (performed at the Institute of Food Technology, BOKU) leads to changed surface properties, as hemicelluloses situated on the surface are attacked. Changes of surface properties effect e.g. the glueing abilities. Both chemical and enzymatic pretreatment of raw material will be used for production of OSB- and particleboards. Inoculation of wood with specific fungi is used to disintegrate wood polymers, mainly lignin. The consequence of this treatment is a decrease of the energy in- put necessary for the refining process ("biopulping", performed by the Institute of Biochemical Technology and Microbiology, TU-Vienna). Fibers treated this way will be used for the MDF-board production.
FT-IR (Fourier Transform Infrared)-spectroscopy is a powerful tool for investigations on molecular structures of wood. IR-spectra reflect the chemical structure of a surveyed sample. IR-spectroscopic methods (MIR and NIR) combined with multivariate statistical methods are used for the determination of lignin and extractive content of wood. IR-spectroscopic investigations in the lignin content of different wood species, wood samples within species but of different origins as well as the variability of the lignin content within a species are part of EU-projects. Lignin and extractive content are important parameters, as they are genetically as well as environmentally determined. The content of extractives plays a key role for predictions of the durability of wood. Furthermore it is possible to classify wood species e.g. to their habitat according to their IR-spectra. IR-spectroscopy can be used for the characterization of modified wood, to estimate the degree of acetylation and to predict mechanical properties of untreated wood.
Special methods of IR-spectroscopy have been developed to characterize the structure of cellulose and its mechanical behavior. An observation of dynamic processes on the molecular level can be performed via coupling dynamic mechanical analysis (DMA) and step-scan FT-IR-spectroscopy. Inter- and intramolecular interactions can be characterized by this method. This research work is carried out in close cooperation with the Swedish Pulp and Paper Research Institute (STFI, Stockholm).