Erythro/threo ratio of β-O-4-5 structures as an important structural characteristic of lignin. Part 4: Variation in the erythro/threo ratio in softwood and hardwood lignins and its relation to syringyl/guaiacyl ratio

Takuya Akiyama,
1. Wood Chemistry Laboratory, Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan

Hitoshi Goto,
2. Wood Chemistry Laboratory, Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan

Deded S. Nawawi,
3. Department of Forest Products Technology, Bogor Agricultural University, Bogor, Indonesia

Wasrin Syafii,
4. Department of Forest Products Technology, Bogor Agricultural University, Bogor, Indonesia

Yuji Matsumoto,
5. Wood Chemistry Laboratory, Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan

Gyosuke Meshitsuka
6. Wood Chemistry Laboratory, Department of Biomaterial Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan

Corresponding author. Wood Chemistry Laboratory, Department of Biomaterial Science, Graduate School of Agricultural and Life Sciences, The University of Tokyo, 1-1-1 Yayoi, Bunkyo Ku, Tokyo 113-8657, Japan Fax: +81-3-5802-8862 E-mail: 

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Abstract

The proportion of erythro- and threo-forms of β-O-4-structures in lignin was elucidated by ozonation analysis of 21 wood species, and the relationship to the syringyl and guaiacyl composition was investigated. For all hardwood species, the erythro-form of β-O-4-structures predominated, although the extent varied widely, depending on wood species. In contrast, the proportion and amount of erythro- and threo-forms were very similar in all softwood species. The proportion of the erythro-form was greater in species with a higher methoxyl content in the
lignin (correlation coefficient, $R^2=0.83$). The S/V ratio (molar ratio of syringaldehyde and syringic acid to that of vanillin and vanillic acid) obtained by nitrobenzene oxidation was also strongly correlated with the proportion of the *erythro*-form ($R^2=0.99$). Accordingly, the syringyl/guaiacyl ratio is closely related to the *erythro/threo* ratio. This stereochemical characteristic of β-O-4-structures is discussed in relation to the process of lignin formation.

*Keywords* β-O-4 structure, *erythro/threo* ratio, hardwood, Klason lignin, lignin, methoxyl, nitrobenzene oxidation, ozonation, softwood, stereochemistry, syringyl/guaiacyl ratio