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Pregledni rad

Ecological issues of byproducts in hydrothermal wood processing

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Sažetak
Based on previous research, this paper presents the basic characteristics of chemical substances formed as a result of hydrothermal wood processing. Wood that had been exposed to a mild thermal treatment was extracted with organic solvents to determine the presence of potentially toxic compounds. The formation of some toxic polynuclear aromatic hydrocarbons derivatives of phenantrene were detected as well as other classes of polyaromatic compounds. It is most likely that the presence of all such compounds contributes to a relatively substantial extent to the reported resistance of heat treated timber to fungal and other biological attack. Other allegedly non-toxic compounds were also found, mainly the by-products of lignin pyrolysis. The extent of toxic and non-toxic compounds in heat treated wood were not quantified, and therefore it is not determined whether the final product (thermal treated wood) is toxic or not, and to what extent. The two major volatile organic compounds found while researching atmospheric emissions from an industrial kiln, drying radiata pine, were alpha – pinene and beta – pinene, which accounted for up to 90% of the total discharge (405 g/m3 wood). Most of the volatile organic compounds were released during early stages of drying. The release of potentially hazardous components (formaldehyde, acetaldehyde, furfural) was found to be relatively low (1.1, 8.7, and 0.1 g/m3 wood) and well dispersed all over the kiln. These levels of release are unlikely to cause adverse environmental effects. Volatile organic components were also researched on radiata pine wood dried in an experimental vacuum kiln. The condensate (volitilased components with water vapour) was sampled at regular time intervals throughout a 114 h drying period. Chemical analysis data from a green wood sample indicated that 10% of monoterpenes present were recovered in the kiln condensate. The main classes of organic compounds identified in the condensate were alcohol monoterpenes (endoborneol, alpha – terpineol, and 1,4-terpineol), methanol, acetic acid, formaldehyde, furfural, and diterpenes. Total amount of carbon and oxygen in the experimental vacuum kiln condensate indicate that the treatment aimed at reducing the concentration of organic compounds in the condensate will be required prior to discharge into environment.

Ključne riječi
hydrothermal wood processing; atmospheric emission; condensate; chemical constituents

[Hrvatski]

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