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Profiles of polycyclic aromatic hydrocarbons in smoke from combustion and thermal decomposition of poplar wood pellets and sawdust

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Abstract—The aim of this paper is to determine the level and distribution of the sixteen polycyclic aromatic hydrocarbons (PAHs) listed by the US Environmental Protection Agency (US-EPA) in smoke from poplar wood pellets and sawdust combustion and thermal decomposition, respectively. Namely, the growth of selected poplar plantations, wood cultivation and production in the north part of the Republic of Serbia, Vojvodina Province, considerably increased. However, mechanical wood processing creates a lot of sawdust, which causes an occupational and environmental risk and also poses a fire hazard. Furthermore, in order to protect the environment and provide additonal energy sources, sawdust is commonly pelletised and further used as a fuel. Thus, the assessment of environmental impact of its use becomes an important issue. Therefore, the intention of the authors was to determine the level and profile of PAHs emitted by combustion and thermal decomposition under atmospheric conditions of poplar wood pellets and sawdust. The 16 US-EPA PAHs were analyzed by gas chromatograph with mass selective detector. The level of total US-EPA 16 PAHs formed during combustion of wood pellets was 4.7 mg kg^{-1}, whereas during the sawdust combustion it was 3.8 mg kg^{-1}, while the resulting total PAHs concentration during thermal degradation under atmospheric conditions of pellets and sawdust was 3.4 mg kg^{-1} and 3.7 mg kg^{-1}, respectively. The most common PAHs present in smoke from the combustion and thermal decomposition under atmospheric conditions of poplar wood pellets were phenanthrene, fluorene and naphthalene, while from the sawdust were phenanthrene, naphthalene, acenaphthylene and fluorene, respectively. BaPeq value obtained during the combustion of wood pellets was 0.081 mg kg^{-1}, whereas from the combustion of sawdust it was 0.047 mg kg^{-1}, while the resulting BaPeq value during the thermal degradation under atmospheric