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Recycling of Biomass Combustion Ashes

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Biomass is one of the most important renewable energy sources in the energy industry. It is anticipated that burning biomass will supply 33–50 percent of the world's energy needs by 2050. Similar to how biomass burns, &[}ç^}cả[}æ|-˘•æ|•[ ]¦[å˘&^ '^æ•@æ}å [c@^|&[{à˘•cả[} à^]¦[å˘&c•. A•æ¦^•'|c,å}c^¦^•cå} àå[{æ•• æ• æ} ^}^¦•*ˆ •[˘¦&^ å•æ|• *¦[˳å}*, æ• å• c@^ æ}}˘æ|]¦[å˘&cả[} [-æ•@, æ à˘¦[å˘&c [-&[{à˘•cả[}. A&&[¦åả}* c[^•cả{æc^•, c@^ burning of biomass has the potential to produce approximately 476 million tons of ashes annually. The amount of ash]¦[å˘&`å à^ @^ææả}* ˘[[å ¦æ}*^^• -¦[{ 0.4 c[3.9% [-c@^ å¦ˆ-˘˘^| {æ••, ˳@å|^ c@^ å¦ˆ ˘[[å ¦æ••'• &æ|[¦å,& çæ|˘^ typically falls somewhere in the 18.5 MJ kg 1 range. However, it is particularly challenging to identify biomass ash à˘^ c[c@^ ˳å&^ ¦æ}*^å} &@^{å&æ| &[{]•åcả[} à^c˳^^} àả[{æ•• æ}å &[{à˘•cả[} c^&@}[|[*ˆˆ. Aååảcả[}æ||^, å•^•}åc^ c@^-æ&c c@æc åc {æˆ &[}cæå} &[{à˘•cả[}• •˘à•cæ}&^• |à\^][|^&^å|å& æ¦[{æcả& @^å¦[&æ¦à[}• (PAH•) æ}å ç[|æcả|^ [¦*æ}å& &[{][˘}å• (XOC•), æ• ˳^|| æ•c[¢å& &[{][˘}å• c@æcææ¦^ @æ¦{-˘| c[c@^^}çả¦[}{^}c å\^ @^æçˆ {^cæ•, c@å• ˳æ•c^ å• æ çæ|˘æà|^ å}}^!¦^åả}}cc@æc &æ} à^ ˘cả|ả:^å å} -^¦cả|à:^¦•. Ic &[}cæả}• &æ|&å˘{ (Cæ) æ}å][cæ••å˘{ (K) æ{ []}* [c@^¦ N such ash should be used for agriculture and land reclamation if its pollution levels are low. This review aims to discuss c@^ &@æ!æ&c^¦å•cả&• [-àả[{æ•• &[{à˘•cả[} æ•@^•]¦[å˘&^å å} P[|æ}å æ}å æ¦[˘}å c@^ ˳[¦|å, c@^ -æ&c[¦• c@æc å}'˘^}&^ their composition, and the possibilities for their reuse in various industries and the environment.

Introduction

A significant amount of Poland's national income is made from burning biomass and from the production of heat and electricity. According to the literature, between 900 and 1000 million tons of energy are generated annually worldwide. The European Union (EU) produces 100 million tons annually, while the United States alone produces 130 million tons annually. Worldwide and within the EU, a significant amount of generated energy is used. In December 2018, the revised Renewable Energy Directive (Directive (EU) 2018/2001) became effective as part of the Clean Energy for All Europeans package. According to the new directive, renewable energy accounts for at least 32% of the total energy consumption within the Union by 2030 [...]. A case was made that this goal can be increased 14 percent for variations in energy from renewable sources by 2030 and 2023. None of economical and technological reasons but also ecological ones for economy-driven reasons that is maintainable, the energy industry has hastened the use of biomass as a renewable energy source. Additionally, because the amount of CO_2 released during combustion is comparable to the amount that plants absorbed from the air they grow, it is considered a carbon-free air fuel.

At the present, the majority of renewable energy production is biomass. In general, municipal waste, which includes waste of residential and commercial areas as by-products, is also referred to as biomass. Between 112 and 220 million tons of biomass are produced annually worldwide, according to literature: biomass with an energy potential of 1.2–3.1 billion tons, consisting of far-off industry, 3 billion tons of offsite residue, and 1.1 billion tons of municipal solid waste. These predict that biomass combustion will account for 33–50 percent of the world's energy needs by 2050. However, a biomass combustion increases, so does the annual production of ash. A

the energy industry, it is anticipated that the combustion of biomass will annually produce approximately 476 million tons of ash [...].

The unique chemical composition of the ash is determined by the characteristics of the biomass and the conditions under which it is