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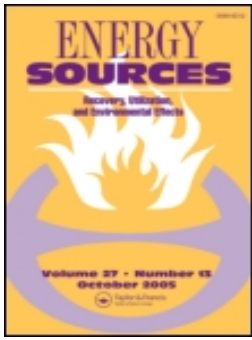
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Characterization and elemental analysis of wood pellets obtained from low-valued types of wood

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ABSTRACT

In this study, we compared the quality of wood pellets obtained from several different raw materials, i.e., *Rhododendron ponticum* (Type 1), *Laurus nobilis* (Type 2), and *Castanea sativa* (Type 3). The quality of the wood pellets was characterized mainly by their bulk density, moisture content, ash content, volatiles, sulfur content in the ash, total sulfur content, heating values, elemental analysis of the ash, and chlorine content. The results showed that bulk density was similar for each type of pellet. In quality values, ash content and the sulfur content in the ash were found to be lower for Type 3 (Chestnut wood pellets) than they were for the other two types. The results also showed that dry samples of Type 1, Type 2, and Type 3 wood pellets had heating values of 5057, 4691, and 4571 kcal/kg, respectively, whereas the original (undried) samples had heating values of 4571, 4409, and 4293 kcal/kg, respectively.

KEYWORDS

Biomass; clean energy; fuel; low-valued resources; wood pellets

1. Introduction

The demand for resources is a key issue for future generations. It has been projected that the population of the world will reach 9.1 billion in 2050, and the demands for energy, health care, and food will increase as a result (Andreev et al., 2013; Mensbrugghe and Roland-Holst, 2009; Anonym, 2009). Increases in population result in increases in global atmospheric pollution, due in large part to the emissions from the use of fossil fuels. Most scientists agree that these emissions have produced climate change the effects of which have generated worldwide interest in using biomass to produce heat, power, and liquid fuels (Heinimo and Junginger, 2009). One of the most promising alternatives is to use various types of biomass in the form of pellets as a heat source (Di Giacomo and Taglieri, 2009). Biomass and biomass residues are an abundant, renewable, sustainable, and comparatively inexpensive source of renewable energy. Biomass residues comprise the largest amount of raw material in the world for the generation of energy (Kim and Dale, 2004; Lu et al., 2014).

Wood pellets and the larger product of refined biomass fuel known as briquettes usually are produced in the form of cylindrical compressed wood products that are made from the by-products of the wood-processing industry. The raw material is mostly dry sawdust, grinding dust, and cutter shavings. Pellets and briquettes also can be made by compressing fresh biomass, bark, and forest chips, but the raw material must be milled and dried before the pelletizing process can take place (Saracoglu and Gunduz, 2009). Wood pellets are a biofuel commodity that is used extensively throughout the world to produce energy (Sikkema et al., 2011). The market for this commodity has been booming in many countries, driven mainly by the fairly low cost per unit of energy to achieve the 2020 targets for energy from biomass (Sgarbossa et al., 2014). Currently, the continuously increasing demand for wood pellets cannot be met by domestic production because of the shortage in primary resources and the competition with large power plants and the wood