PHYSICAL-CHEMICAL AND ENERGETIC CHARACTERISTICS OF THREE FUELS RECOVERED FROM MUNICIPAL WASTE

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Introduction

Circular Economy Action Plan underlines that separate collection of waste is a prerequisite for high-quality recycling and for keeping valuable materials and products in the recycling loop. This leads to the optimization of waste management by increasing the degree of recovery of useful components and their transformation into secondary raw materials such as alternative fuels. Using an alternative fuel which meets the quality parameters well defined for the purpose of energy production in combustion installations, represents one of the possible solutions for reducing the impact of waste on the environment. **In this regard, the aim of the present work is to evaluate from a technical and energetic point of view, 3 solid alternative fuels obtained from municipal solid waste and sewage sludge.**

Materials and methods

Materials

- **Three Solid Alternative Fuels** prepared from **Sewage Sludge (SS)** in mixture with fractions of: **Plastic (PLW), Wood Chips (WCW),** and **Cardboard (CBW)**, separated from Municipal Waste; The sewage sludge and the separated fractions of municipal waste, were combined in a 3:1 ratio of SS:PLW, SS:WCW and SS:CBW; The fuels are in the form of briquettes with dimensions of 3.5/10 cm.
- To obtain good and reliable laboratory results from representative and homogeneous fuel samples, the solid fuels under analysis, were crushed through laboratory mills equipped with 2mm and 0.5mm sieves, Retsch SR 300 and Retsch RS 200.

Methods

Laboratory analyses were carried out in accordance with the standards in force of Solid Recovered Fuels. Physico-chemical composition of the fuels was established, by determining the following parameters: moisture content (W) - EN ISO 21660-3:2021, ash (A) - EN ISO 21656:2021, carbon (C), hydrogen (H), nitrogen (N), sulfur (S) - EN ISO 21663:2020, lower calorific power (LHV) - EN ISO 21654:2021, chlorine (Cl) - EN 15408:2011 and mercury (Hg) - EN 15411:2011.

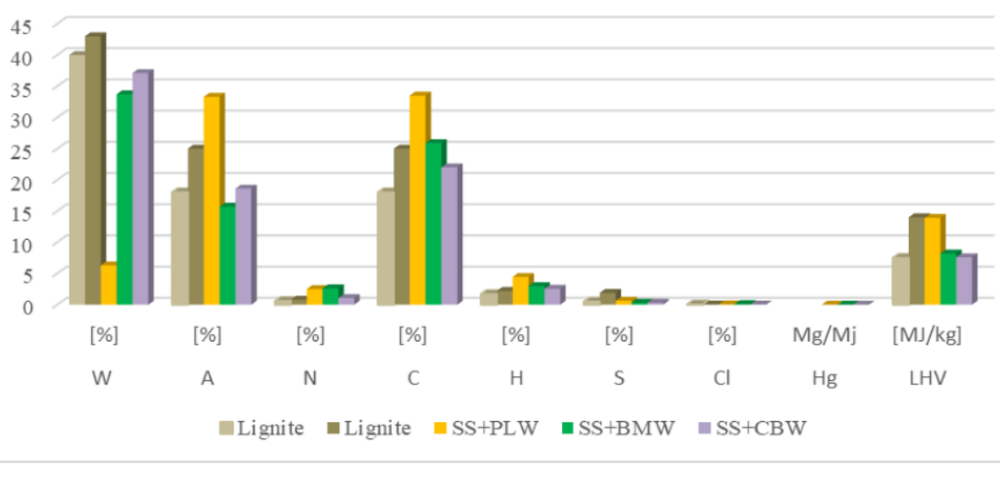
Determination of the major characteristics (net calorific value, chlorine and mercury concentrations.), allowed the studied fuels to be classified in the SRF's classes, according to the requirements of the EN ISO 21640:2021 standard.

Results and conclusions

Physical-chemicals characteristics of solid alternative fuels compared with an inferior coal

Parameters	Units	Lignite	SS+PLW	SS+WCW	SS+CBW
W	[%]	40-43	6.30	33.7	37.1
A		18-25	33.3	15.7	18.6
N		0.6-0.8	2.51	2.62	1.06
C		18-25	33.5	25.9	22.0
H		1.7-2.2	4.44	2.99	2.55
S		0.5-1.9	0.64	0.31	0.31
Cl		<0.03	0.05	0.09	0.04
Hg	Mg/Mj	-	≤0.01	≤0.01	≤0.01
LHV	MJ/kg	(7.5 – 14.0)	13.9	8.2	7.6

Figure 1 - Characteristics of the alternative fuels obtained from municipal solid waste



- ✓ Specific values of **LHV** for all three studied solid fuels are **higher than 6 MJ/kg**, which is the minimum condition for placing a combustible material in the fuels category.
- ✓ By similarity with the solid fossil fuels, the **values for the lower heating value, ash and carbon content** of the solid combustibles are **comparable to those of the lignite**, which is an inferior coal.
- ✓ The solid fuel with plastic waste content (**SS+PLW**) has a calorific value **higher than 10MJ/Kg**, being assigned to the **IV class** of **SRF**. With values **greater than 3 MJ/kg**, the alternative fuels (**SS+WCW and SS+CBW**), are assigned to the **V class of SRF**.
- ✓ The values for **chlorine** content was **lower than 0.2%,** while the content of **mercury** was **lower than the quantification limit of the method**, thus, placing the 3 alternative fuels to the **class I of SRF**.

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