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SLAGGING CHARACTERISTICS OF THE ASH RESULTING FROM THE SRFs COMBUSTION

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Introduction

Waste is not only an environmental problem, but also an economic loss. An efficient method of waste management is energy generation. Waste can be pre-treated with moderate to severe treatments in order to acquire improved properties for incineration. After treatments, alternative fuels with better properties are obtained. These fuels are called: RDF (refuse-derived fuel) and SRF (solid recovered fuels). In addition to knowing the energy characteristics of fuels, an important role in the design and operation of plants have the fusion characteristics of ash. The major ash-forming elements (Al, Ca, Fe, Mg, P, K, Si, Na and Ti) are responsible for the behavior of ash on melting, the formation of deposits on grids and corrosion processes. During the combustion process, some alkaline species are subjected to possible chemical reactions, including sulfation, chlorination and carbonation. Therefore, sulfates, chlorides and alkali carbonates together with silicates and aluminosilicates influence ash behavior issues. In this context, the experimental study presented in this paper aimed to determine the slagging characteristics of the ash resulting from the combustion of 3 types of SRFs obtained in our laboratory. Based on the results of the laboratory analyzes obtained for the major ash-forming elements, the slagging indices were calculated. Assessment of the slagging propensity of SRFs was carried out on the basis of the following indices: the sum of basic oxides (RB), the ratio between basic oxides and acidic oxides (RB/A), slagging index (Rs) and index for the characterization of melt viscosity (S_R). Five levels of risk were estimated and a score was given to each level, in an increasing order of the risk (Table 1).

Table 1. Slagging risk assesment for the analyzed samples

Level of the risk	Score	Level of the risk	Score	Level of the risk	Score
Outside the risk zone	0	High tendency	3	Very High tendency	4
Small tendency	1	The moderate tendency	2		

Materials and methods

The studied SRFs contain dehydrated sewage sludge in a proportion of 75%, mixed with: 25% plastic waste (SPW), wood waste (SWW) and, cardboard waste (SCW). The oxide composition of the SRF's ashes was analyzed by the X-ray Fluorescence analytical technique, in accordance with the SR EN 15309:2007 standard, using the Rigaku CG X-ray spectrofluorimeter. Sulfur and chlorine were analyzed in

accordance with the EN 15408:2011, using for the sample preparation a calorimetric bomb IKA C6000.

Results and conclusions

Oxide composition of the SRFs are represented graphically in Figure 1.

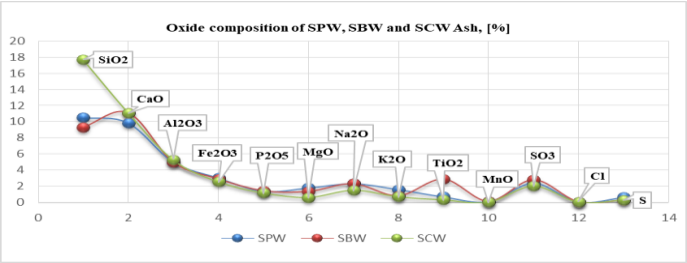

Fig. 1. Oxide composition of SPW, SWW and SCW

In order to evaluate the risk of the slagging, the slagging indices were delimited in few domains (Table 2). Slagging indices were calculated based on the oxides composition and, depending on the level of risk, the corresponding scores were given (Table 3).

Table 2. The domains for the slagging indices

R_B	$R_{B/A}$	S_R	R_S	Risk of slagging / Risk level
-	<0.75	-	-	the tendency of slagging decreases / 0
<35	-	> 72	< 0,6	the tendency of slagging is small / 1
-	-	65-72	0,6 – 2,0	the tendency of slagging is medium /2
35-55	~ 0.75	≤ 65	2,0 – 2,6	high slagging tendency / 3
-	0.75-2.0	-	> 2,6	very high slagging tendency / 4

Table 3. Indices and risk level to slagging for the studied SRFs

SRF	R_A	R_B	$R_{B/A}$	S_R	R_S	Total risk level
SPW	54.3	30.7	0.56	63.3	1.1	
Risk level	-	1	0	3	2	6
SWW	51.2	31.3	0.61	59.3	1.6	
Risk level	-	1	0	3	2	6
SCW	50.1	36.4	0.73	54.9	2.4	
Risk level	-	3	0	3	3	9

From the analysis of the slagging risk, it can be observed that during the burning process all the samples are in an area of medium risk of slagging, but SPW and SWW samples are in the most favorable situation from the point of view of the slagging propensity.

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