Characterization of Slag-Rec dry granulated EAF slag

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The aim of ASO Siderurgica in developing the SLAG-REC system for the treatment of EAF slag is:

to obtain a processing route to transform liquid slag into a solid product by taking under control the process parameters

only under this condition the reproducibility of the process can be assured, as well as the quality of the solid slag, not only from the point of view of its chemical composition, but also of its mineralogical constitution

Leaching of heavy metals by the EAF slag is not related only to its chemical composition, but ***is principally dependent on the phases where the heavy metals are present***, i.e. on the mineralogical constitution of the slag

The way towards a slag selling product:

- Metallurgical adjustments of the EAF operative practices
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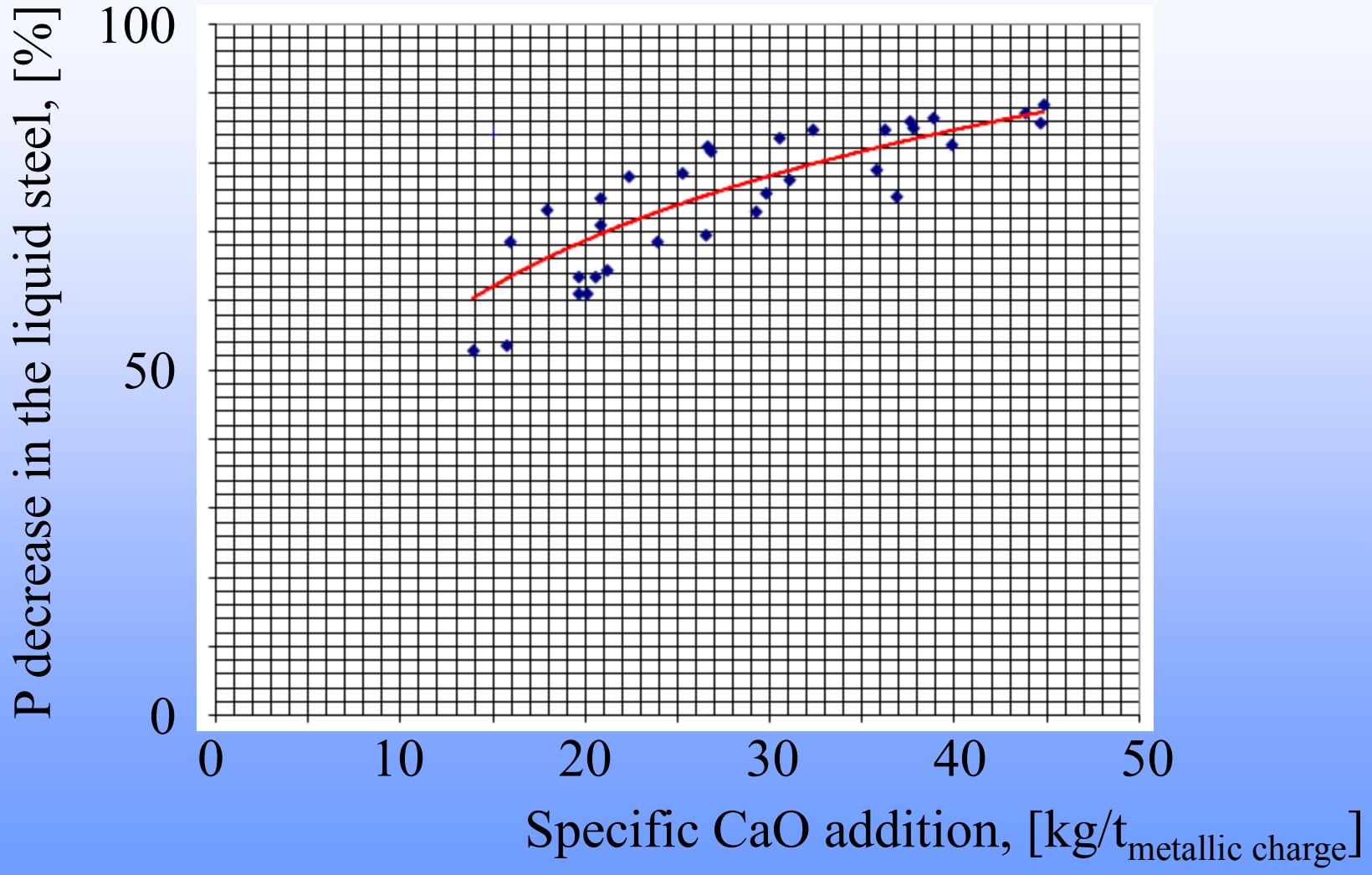
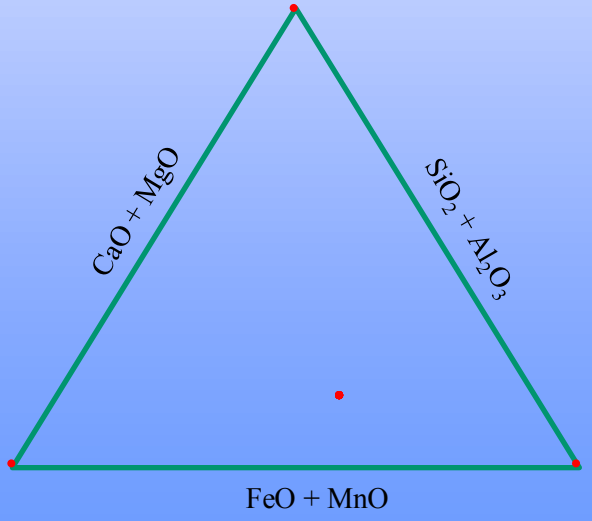
Control of slag chemistry through minor adjustments of the operative practices at the EAF

- Fixed specific amount of O_2
- Amount of charged C dependent of metallic charge type (unalloyed low C scrap, alloyed scrap, cast iron, …)
- Nearly constant level of final bath oxidation (optimize final iron oxide content in the slag)
- Minimum amount of added CaO (according to the final P content in the steel)


P decrease in the liquid steel, [%]
100
50
0
0
10
20
30
40
50
Specific CaO addition, [kg/t metallic charge]

Typical EAF slag chemical composition

SiO_2	Al_2O_3	FeO	MnO	Cr_2O_3	CaO	MgO	TiO_2	P_2O_5
10,36	4,040	42,69	5,75	3,31	30,87	2,13	0,36	0,400



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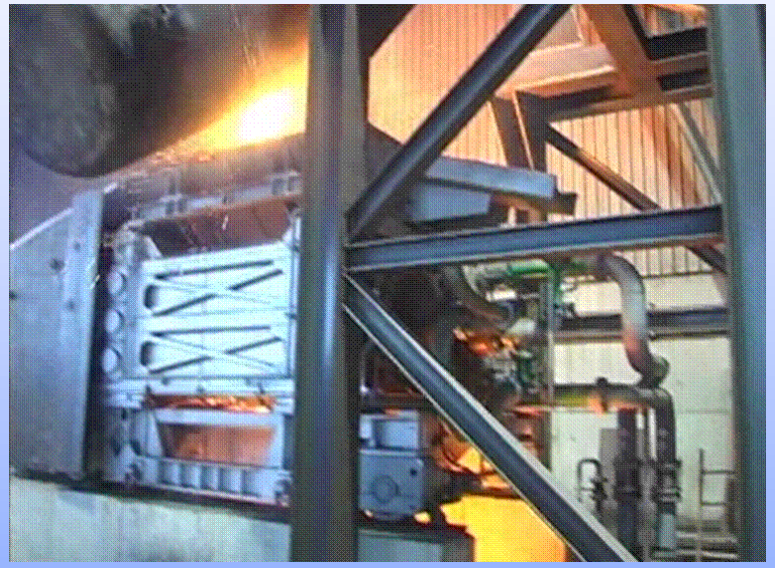
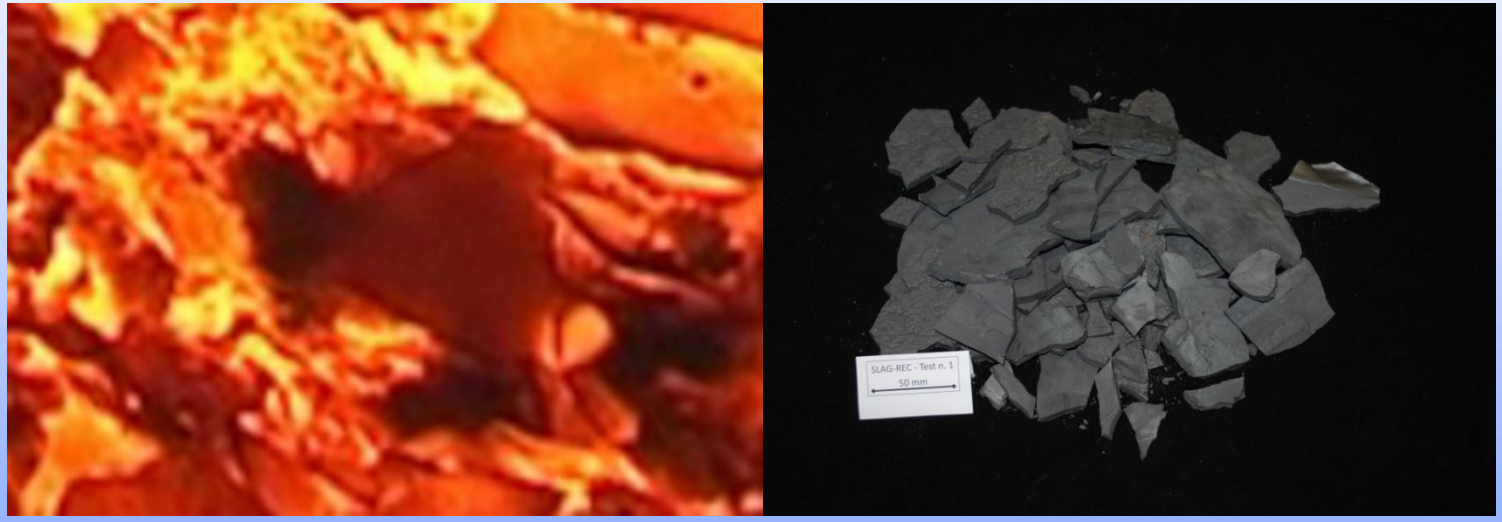
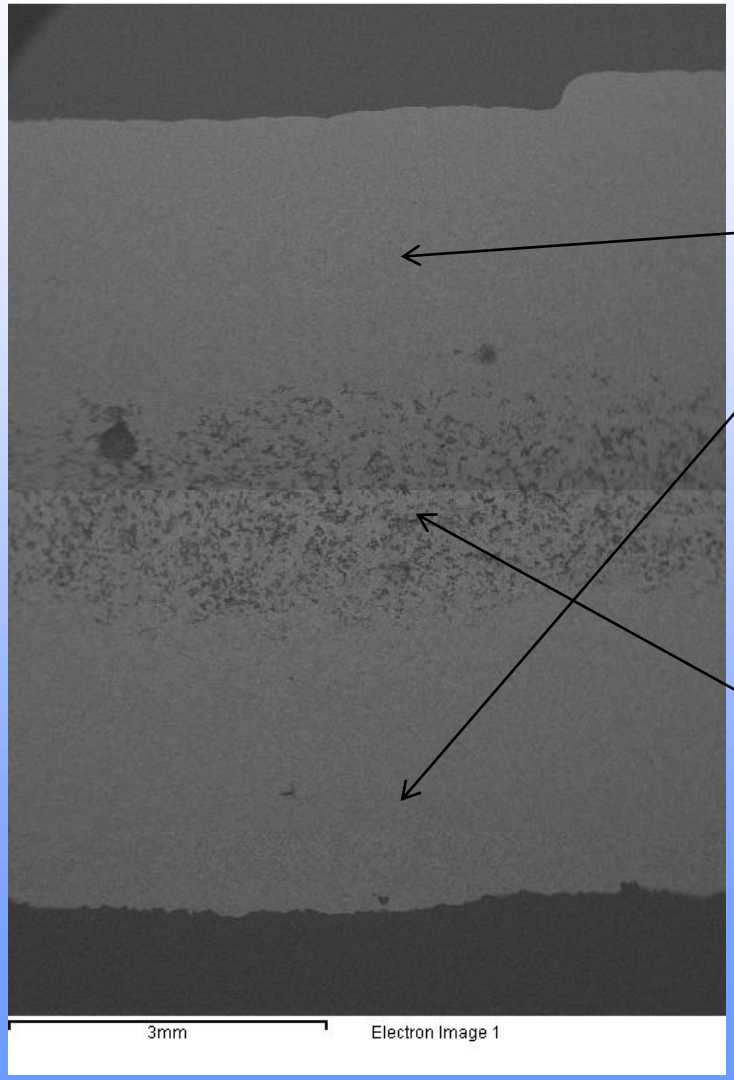
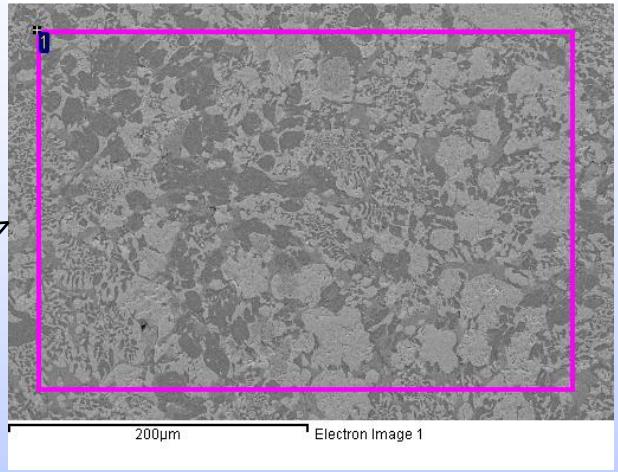


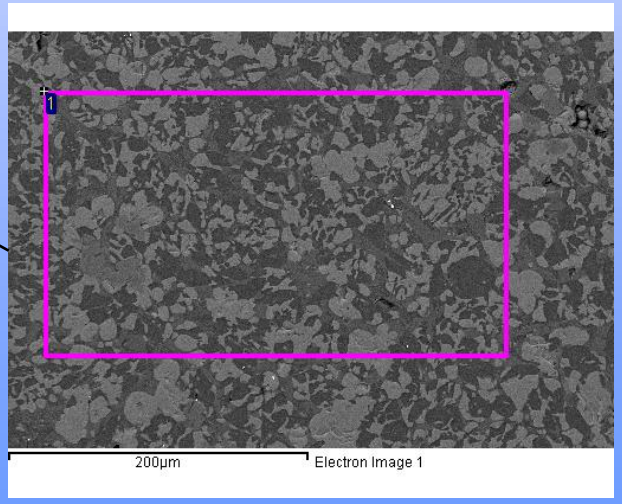
Charging liquid slag into the Slag-Rec machine (left) and solid slag coming out (right)

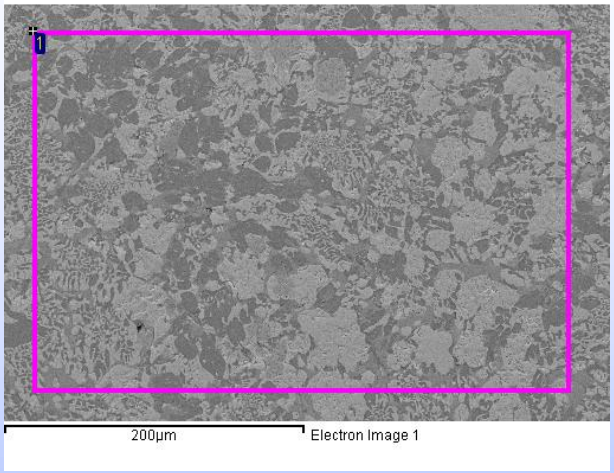


Hot and cold solid slag


3mm
Electron Image 1


1
200µm
Electron Image 1


1
200µm
Electron Image 1

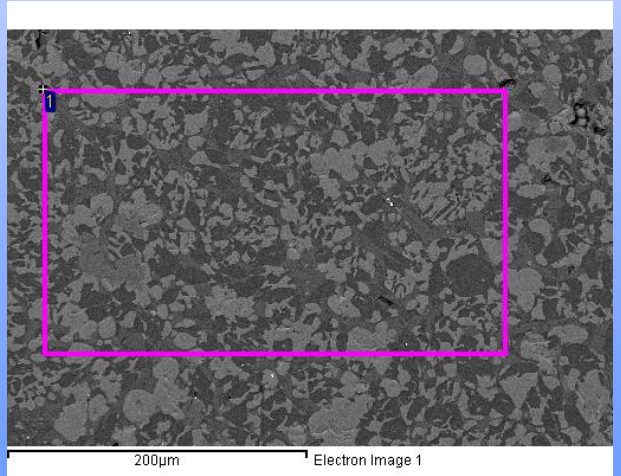


External layers

Processing option : All elements analysed (Normalised)

Spectrum	O	Mg	Al	Si	Ca	Cr	Mn	Fe	Total
1	20.49	1.11	2.35	6.08	21.43	1.78	5.38	41.39	100.00

All results in weight%



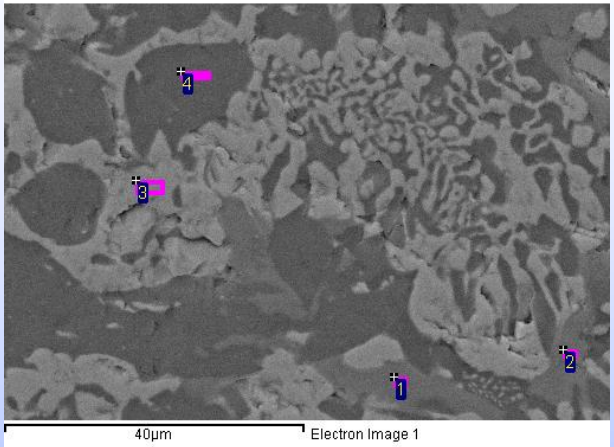
Processing option : All elements analysed (Normalised)

Spectrum	O	Mg	Al	Si	Ca	Cr	Mn	Fe	Total
1	21.65	1.09	3.34	7.65	24.91	1.81	4.40	35.15	100.00

All results in weight%

Central layer

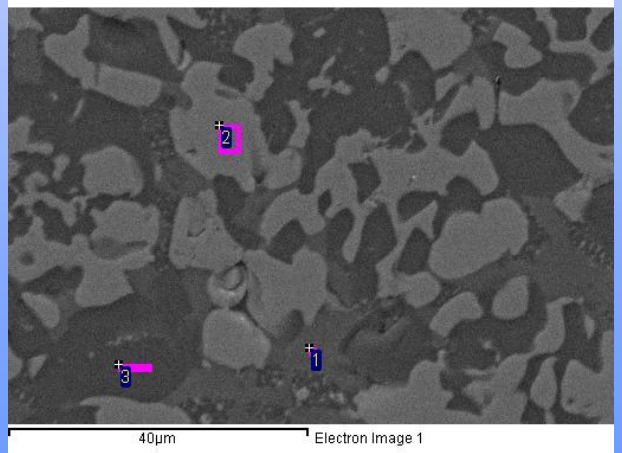
External layers



Processing option : All elements analysed (Normalised)

Spectrum	O	Mg	Al	Si	Ca	Ti	V	Cr	Mn	Fe	Total
1	23.91		9.67	1.00	35.82	2.28	0.82		0.97	25.54	100.00
2	22.91		10.60	1.07	36.26	1.52	0.75		1.18	25.71	100.00
3	13.98	2.96			4.95			2.09	9.27	66.75	100.00
4	27.68			18.20	52.66					1.46	100.00

All results in weight%



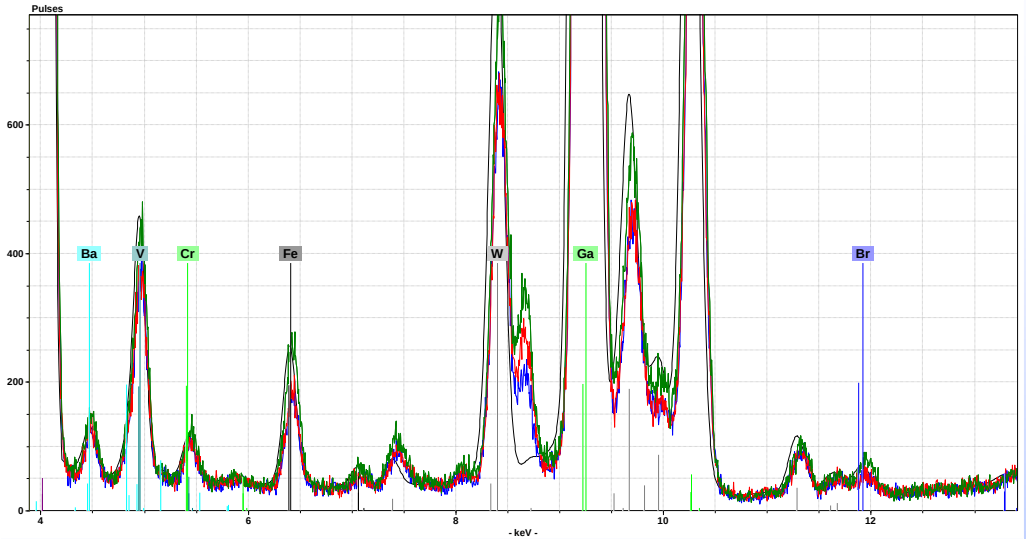
Processing option : All elements analysed (Normalised)

Spectrum	O	Mg	Al	Si	Ca	Ti	V	Cr	Mn	Fe	Total
1	23.50		9.85	1.00	36.84	1.48	0.52		1.05	25.75	100.00
2	13.95	3.11	0.71		2.91			1.96	9.59	67.79	100.00
3	27.81			18.03	52.60					1.55	100.00

All results in weight%

Central layer

TXRF results on leaching solution



Element	Conc1 (mg/l)	Conc2 (mg/l)	Conc3 (mg/l)	Media Conc. (mg/l)	dev.st
Al	28,84	29,574	26,699	**28,371**	1,494
S	0,425	0,419	0,41	**0,418**	0,008
Cl	0,54	0,491	0,502	**0,511**	0,026
K	0,676	0,624	0,627	**0,642**	0,029
Ca	48,021	48,462	48,174	**48,219**	0,224
V	0,095	0,099	0,1	**0,098**	0,003
Cr	0,005	0,0046	0,0053	**0,005**	0,001
Fe	0,035	0,026	0,028	**0,030**	0,005
Ga	1	1	1	**1**	0
Br	0,003	0,002	0,002	**0,002**	0,001
Sr	0,259	0,256	0,257	**0,257**	0,002
Ba	0,07	0,072	0,074	**0,072**	0,002
W	0,184	0,181	0,186	**0,184**	0,003

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Only laboratory investigations while waiting for the full scale crushing and sieving system:
Laboratory crushed slag, sieved into three size ranges

Mechanical and morphological properties of the laboratory crushed slag *:

Flatness index	24.2 %
Shape index	15.6 %
Sand equivalent	86.6 %
Mohs' hardness	6
Los Angeles	28.8 %
Volume mass	3.92 Mg/m^3
Bulk density	1.86 Mg/m^3
Water absorption	0.2 %

* Not representative of the final product as obtained on laboratory crushed slag with max size in the range 10-12.5 mm

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