Steelmaking and Ladle Slag Basicity Ratios

Basicity of a steelmaking slag as V = CaO/SiO2, B with MgO and P2O5 equivalents, the excess-base measure and the ladle-furnace basicity with Al2O3.

Input parameters

Unit system: SI

Parameter	Value	Unit
CaO	45.000	%
MgO	8.0000	%
SiO_2	14.000	%
P_2O_5	2.0000	%
Al_2O_3	3.0000	%
MnO	5.0000	%
TiO_2	0	%

Calculated results

Parameter	Value	Unit
Basicity V = CaO/SiO_2	3.2143	
Basicity B (MgO and P_2O_5 equivalents)	3.5842	
Excess base	42.000	%
Ladle-furnace basicity (with Al_2O_3)	3.5570	

Notes for this case

• On a molar basis MgO counts as CaO (1.4 = 56/40) and ½P_2O_5 as SiO_2 (0.84 = 60/71); in ladle slags Al_2O_3 counts as SiO_2 (0.6 = 60/102). Analyses including undissolved lime and MgO overstate the basicity of the liquid slag. For MgO < 8 % and P_2O_5 < 5 %, B ≈ 1.17V.

Formula and method

$$V = \frac{\%CaO}{\%SiO_2}, \quad B = \frac{\%CaO + 1.4\%MgO}{\%SiO_2 + 0.84\%P_2O_5}, \quad B_{LF} = \frac{\%CaO + 1.4\%MgO}{\%SiO_2 + 0.6\%Al_2O_3}$$

Variables

$\%CaO$	CaO	-
$\%MgO$	MgO	-
$\%SiO_2$	SiO_2	-
$\%P_2O_5$	P_2O_5	-
$\%Al_2O_3$	Al_2O_3	-
$\%MnO$	MnO	-
$\%TiO_2$	TiO_2	-
V	Basicity V = CaO/SiO_2	-
B	Basicity B (MgO and P_2O_5 equivalents)	-
Δ	Excess base	-
B_{LF}	Ladle-furnace basicity (with Al_2O_3)	-

Method and standards

Mass-ratio slag basicities.

Assumptions and limits

- Mass-concentration ratios on the analysed slag.

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/materials/steelmaking-foundry/slag-basicity-ratios

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Reopens the calculator with the inputs of this report.