

# Certificate of Analysis

## STANDARD REFERENCE MATERIAL 178

### O.4C Basic Oxygen Furnace Steel

ANALYST	C	Mn	P	S	Si	Cu	Ni	Cr	V	Mo
	Combustion-Gravimetric	Persulfate-Arsenite	Photometric	Combustion-titration	Perchloric acid dehydration	Photometric	Photometric			Photometric
1	0.398	{0.822 } {.825 <sup>a</sup> }	0.011 <sup>b</sup>	0.014 <sup>c</sup>	0.163 <sup>d</sup>	{0.031 } {.034 <sup>e</sup> }	0.012	{0.018 <sup>f</sup> } {.015 <sup>f</sup> }	{0.001 <sup>g</sup> } {.001 <sup>g</sup> }	0.003
2	.398	.827	.012 <sup>h</sup>	.014	.162	.032 <sup>i</sup>	.010	.015 <sup>j</sup>	.001 <sup>k</sup>	.003
3	.394 <sup>l</sup>	.817 <sup>m</sup>	.011 <sup>n</sup>	.012	.163 <sup>d</sup>	.033 <sup>o</sup>	.009	.014 <sup>e</sup>	.001 <sup>p</sup>	.002
4	{.396 <sup>l</sup> } {.392 }	.828	.013 <sup>h</sup>	.013	.160 <sup>d</sup>	{.030 } {.033 <sup>e</sup> }	{.011 } {.011 <sup>e</sup> }	{.015 <sup>q</sup> } {.020 <sup>e</sup> }	.002 <sup>r</sup>	.002
5	.394	.826	.011 <sup>h</sup>	.015	.167 <sup>d</sup>	.033 <sup>o</sup>	.010	.015 <sup>s</sup>	.001 <sup>t</sup>	.003
Average	0.395	0.824	0.012	0.014	0.163	0.032	0.010	0.016	0.001	0.003

<sup>a</sup> Neutron activation analysis.

<sup>b</sup> Molybdenum-blue photometric method. See J. Res. NBS 26, 405 (1941) RP1386.

<sup>c</sup> 1-g sample burned in oxygen at 1450 °C and sulfur dioxide absorbed in starch-iodide solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO<sub>3</sub> solution.

<sup>d</sup> Double dehydration.

<sup>e</sup> Atomic absorption method.

<sup>f</sup> Chromium separated from the bulk of the iron in a 10-g sample by hydrolytic precipitation with NaHCO<sub>3</sub>, oxidized with persulfate and titrated potentiometrically with ferrous ammonium sulfate solution.

<sup>g</sup> Vanadium separated as in (f), oxidized with HNO<sub>3</sub> and titrated potentiometrically with ferrous ammonium sulfate solution.

<sup>h</sup> Alkali-molybdate method.

<sup>i</sup> Cuprizone photometric method.

<sup>j</sup> Oxidized chromium titrated amperometrically with ferrous ammonium sulfate solution.

<sup>k</sup> Oxidized vanadium titrated amperometrically with ferrous ammonium sulfate solution.

<sup>l</sup> Thermal conductivity method.

<sup>m</sup> KIO<sub>3</sub> photometric method.

<sup>n</sup> Ammonium vanadate-phosphomolybdate photometric.

<sup>o</sup> Neocuproine photometric method.

<sup>p</sup> Flame emission spectroscopy.

<sup>q</sup> Diphenylcarbazide photometric method.

<sup>r</sup> Benzoyl phenylhydroxylamine photometric method.

<sup>s</sup> Chromium oxidized with HClO<sub>4</sub>-titration with FeSO<sub>4</sub>-KMnO<sub>4</sub>.

<sup>t</sup> Vanadium precipitated with cupferron and determined by FeSO<sub>4</sub>-(NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub>-KMnO<sub>4</sub> method.

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