

# National Bureau of Standards Certificate of Analyses

OF

## STANDARD SAMPLE 72A CHROMIUM-MOLYBDENUM STEEL

ANALYST *	C	Mn	P		S		Si	Cr	Mo	TUNGSTEN				
	Direct combustion		Gravimetric (Weighed as MgP <sub>2</sub> O <sub>7</sub> after removal of arsenic)	ALKALI-MOLYBDATE <sup>a</sup>	Gravimetric (Direct oxidation and final precipitation in reduced solution)	Evolution with HCl ZnS-Iodine (theoretical sulphur titre) <sup>b</sup>	Sulphuric acid dehydration				COPPER H <sub>2</sub> S-Cu <sub>2</sub> S-CuO	NICKEL Weighed as nickel dimethylglyoxime	FeSO <sub>4</sub> -KMnO <sub>4</sub> titration	VANADIUM
1	0.312	0.595 <sup>c</sup>	0.015	0.017	0.030	0.028	0.222	0.080	0.029	0.657 <sup>d</sup>	0.002 <sup>e</sup>	0.201 <sup>f</sup>		Not detected.
2	.314	.597 <sup>g</sup>	.016	.016	.028 <sup>h</sup>	.026	{.228 .230 <sup>i</sup> }	.078 <sup>j</sup>	.033	.657	.006 <sup>k</sup>	.195 <sup>l</sup>		
3		.606 <sup>l</sup>		.018	.031	.029 <sup>m</sup>		.082 <sup>j</sup>	.04 <sup>n</sup>	.648	.006 <sup>o</sup>	.203 <sup>f</sup>	0.203	
4	.319	.596 <sup>p</sup>	.015	.016	.026		.227	.08	.02	.657 <sup>d</sup>	.004 <sup>q</sup>	.202 <sup>f</sup>	.208	Not detected.
5	.325	.605 <sup>r</sup>	.018	.019 <sup>s</sup>	.031	.030 <sup>m</sup>	.219	.073 <sup>j</sup>		.662 <sup>d</sup>		.201 <sup>f</sup>		
	.318	.59 <sup>g</sup>	.015	.015	.032	.031 <sup>ms</sup>	.221			.657			.198	
	.312	{.599 <sup>g</sup> .606 <sup>l</sup> }		.016	.025		{.225 .223 <sup>i</sup> }	.074 <sup>n</sup>	.033	.651		.199 <sup>v</sup>		
8	.315	.604 <sup>s</sup>	.015	.016		.032 <sup>m</sup>	{.224 <sup>i</sup> .223}	.082 <sup>j</sup>	.028	.654 <sup>x</sup>	.007 <sup>w</sup>	.206 <sup>y</sup>	.205	
9	.316	.592 <sup>o</sup>	.016	.015	.028	.027	.223 <sup>i</sup>	.083 <sup>j</sup>	.029	.654 <sup>d</sup>		.208 <sup>f</sup>	.210	
10	.324	{.606 <sup>l</sup> .596 <sup>g</sup> }		.017 <sup>s</sup>		.029 <sup>ms</sup>	.224	.075		.653 <sup>x</sup>		.204 <sup>v</sup>	.196	
Averages	.317	.599	.016	.017	.029	.029	.224	.079	.030	.655	.005	.202	.203	
Recommended values	.317	.599	.016	.017	.029	.029	.224	.079	.030	.655	.003	.202	.203	

<sup>a</sup> Precipitated at 40° C., washed with a 1 percent solution of KNO<sub>3</sub> and titrated with alkali standardized by the use of National Bureau of Standards acid potassium phthalate and the 23:1 ratio.  
<sup>b</sup> Value obtained by standardizing titrating solution by means of sodium oxalate through KMnO<sub>4</sub> and Na<sub>2</sub>SO<sub>4</sub>.  
<sup>c</sup> Chromium separated by precipitating with NaHCO<sub>3</sub> and manganese then determined by bismuthate (FeSO<sub>4</sub>-KMnO<sub>4</sub>) method.  
<sup>d</sup> Chromium oxidized by AgNO<sub>3</sub>-(NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and titrated potentiometrically with FeSO<sub>4</sub>.  
<sup>e</sup> Bulk of iron removed from a 10-gram sample by extracting with ether. Vanadium oxidized in the acid-extracted residue by boiling with HNO<sub>3</sub>, and titrated potentiometrically with FeSO<sub>4</sub>.  
<sup>f</sup> α-benzoinoxime method. See BS J. Research 9, 1 (1932) RP 453.

<sup>g</sup> Persulphate-arsenite method.  
<sup>h</sup> Meinelke method.  
<sup>i</sup> Perchloric acid dehydration.  
<sup>j</sup> Finished by electrolysis.  
<sup>k</sup> Vanadium separated by cupferron in the presence of ferrous iron. Titrated by ferrous sulphate-persulphate method.  
<sup>l</sup> Bismuthate-arsenite method.  
<sup>m</sup> H<sub>2</sub>S absorbed in ammoniacal CdCl<sub>2</sub> solution.  
<sup>n</sup> Ignited and weighed as NiO.  
<sup>o</sup> Ferrous sulphate-persulphate method.  
<sup>p</sup> Chromium separated by precipitating with zinc oxide, and manganese then determined by bismuthate (FeSO<sub>4</sub>-KMnO<sub>4</sub>) method.  
<sup>q</sup> Bulk of iron removed from a 5-gram sample by extracting with ether. Acid-extracted residue treated with cupferron and vanadium determined colorimetrically.

<sup>r</sup> Oxidized by bismuthate and titrated potentiometrically with HgNO<sub>2</sub>.  
<sup>s</sup> Titrating solution standardized by use of a standard steel.  
<sup>t</sup> Volhard method.  
<sup>u</sup> Titrated with thiosulphate.  
<sup>v</sup> Weighed as PbMoO<sub>4</sub>.  
<sup>w</sup> Copper and molybdenum separated by H<sub>2</sub>S from a 20-gram sample. Bulk of iron then removed by extraction with ether. Vanadium precipitated by cupferron and determined by HCl-KMnO<sub>4</sub> method.  
<sup>x</sup> Chromium oxidized with HClO<sub>4</sub>.  
<sup>y</sup> Initial H<sub>2</sub>S precipitation. Copper separated by NaOH, molybdenum again precipitated with H<sub>2</sub>S, and ignited to MoO<sub>3</sub>.

### \*LIST OF ANALYSTS

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