

# **CERTIFICATE OF ANALYSES**

## **REFERENCE MATERIAL OF IRON ORE**

### **IMZ 2.66/1**

Analysis listed as percent by weight [% m/m]:

|                                    |              |
|------------------------------------|--------------|
| <b>Fe</b>                          | <b>29.04</b> |
| <b>SiO<sub>2</sub></b>             | <b>44.94</b> |
| <b>CaO</b>                         | <b>3.42</b>  |
| <b>MgO</b>                         | <b>0.95</b>  |
| <b>Al<sub>2</sub>O<sub>3</sub></b> | <b>3.13</b>  |
| <b>Mn</b>                          | <b>0.078</b> |
| <b>P</b>                           | <b>0.030</b> |
| <b>S</b>                           | <b>0.10</b>  |

Certificate Number: IMZ 2.66/1-100125

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| Res. No                | % Fe         | % SiO <sub>2</sub> | % CaO       | % MgO       | % Al <sub>2</sub> O <sub>3</sub> | % Mn         | % P          | % S         |
|------------------------|--------------|--------------------|-------------|-------------|----------------------------------|--------------|--------------|-------------|
| 1                      | 29,35        | 45,66              | 3,65        | 1,08        | 3,31                             | 0,087        | 0,036        | 0,11        |
| 2                      | 29,20        | 45,43              | 3,55        | 1,04        | 3,25                             | 0,086        | 0,034        | 0,11        |
| 3                      | 29,18        | 45,31              | 3,54        | 1,03        | 3,17                             | 0,084        | 0,033        | 0,11        |
| 4                      | 29,15        | 45,23              | 3,51        | 0,99        | 3,16                             | 0,081        | 0,031        | 0,11        |
| 5                      | 29,05        | 45,00              | 3,48        | 0,97        | 3,16                             | 0,081        | 0,030        | 0,11        |
| 6                      | 29,04        | 44,94              | 3,45        | 0,97        | 3,14                             | 0,080        | 0,029        | 0,10        |
| 7                      | 29,02        | 44,76              | 3,41        | 0,96        | 3,13                             | 0,080        | 0,029        | 0,10        |
| 8                      | 28,98        | 44,75              | 3,34        | 0,95        | 3,11                             | 0,076        | 0,028        | 0,10        |
| 9                      | 28,96        | 44,67              | 3,30        | 0,93        | 3,08                             | 0,074        | 0,024        | 0,10        |
| 10                     | 28,95        | 44,67              | 3,27        | 0,87        | 3,05                             | 0,072        |              | 0,09        |
| 11                     | 28,86        | 44,49              | 3,14        | 0,86        | 3,03                             | 0,070        |              |             |
| 12                     | 28,76        | 44,41              |             | 0,80        | 3,02                             | 0,069        |              |             |
| <b>Certified value</b> | <b>29,04</b> | <b>44,94</b>       | <b>3,42</b> | <b>0,95</b> | <b>3,13</b>                      | <b>0,078</b> | <b>0,030</b> | <b>0,10</b> |
| <b>C(95%)</b>          | 0,11         | 0,27               | 0,12        | 0,05        | 0,06                             | 0,004        | 0,003        | 0,004       |

$C(95\%) = (t \cdot sd) / \sqrt{n-1}$  - The half-width confidence interval calculated for the 95 % confidence level, where t is the appropriate Student's t value,

**Certification Process:** Both preparation of this Reference Material and certification process were prepared according to requirements of ISO Guide 31, ISO Guide 34 and ISO Guide 35. This Reference Material is in agreement with ISO Guide 30.

**Chemical Analysis:** Chemical analyses were carried out on dried at 105°C powder samples. Single values in the above table are the means obtained by individual laboratories. The following methods were used for analysis:

Fe - complexometric titration; volumetric by titration with dichromate solution;  
SiO<sub>2</sub> - gravimetric after dehydration with perchloric acid;  
CaO - complexometric titration; atomic absorption spectrometry;  
MgO - complexometric titration; atomic absorption spectrometry;  
Al<sub>2</sub>O<sub>3</sub> - complexometric titration, atomic absorption spectrometry;  
Mn - titrimetric with arsenite nitrate solution, atomic absorption spectrometry,  
P - alkalimetric titration, photometric as molybdenum blue,  
titrimetric, after precipitation as ammonium phosphomolybdate;  
S - combustion infrared absorption; combustion alkalimetric titration; combustion iodometric titration; gravimetric;

#### The laboratories participating in certification analysis:

- Steelworks Czestochowa, Poland
- Steelworks Bobrek, Bytom, Poland
- Steelworks Florian, Świętochłowice, Poland
- Steelworks T. Sendzimira, Kraków, Poland
- Steelworks Katowice, Dąbrowa Górnicza, Poland
- Steelworks Pokój, Ruda Śląska, Poland
- Institute for Ferrous Metallurgy, Gliwice, Poland

- Institute for Refractory Materials, Gliwice, Poland
- Energopomiar, Gliwice, Poland
- Steelworks Ostrowiec, Ostrowiec Świętokrzyski, Poland
- Steelworks Trzyniec, CR
- Steelworks Ostrava, CR

**Homogeneity:** The homogeneity of this Reference Material was evaluated with the use of X-ray fluorescence spectrometry and found acceptable.

**Available form:** 100g of powder sample, grain size less than 0.1 mm.

**Intended use:** This Reference Material is intended for use in determination of chemical composition of iron ores by x-ray fluorescence spectrometry, UV-Vis spectrometry, AAS, ICP-AES and C,S-analyzers and other wet methods. Chemical analyses should be carried out on samples dried at 105°C.

**Validity of certification:** The certification of IMZ 2.66/1 is valid for 15 years - until May 2035, within the uncertainty specified provided this Reference Material is stored in accordance with the instructions given in this certificate (see Storage). The certification is nullified if this Reference Material is damaged, contaminated or otherwise modified.

**Revision:** This Reference Material was certified originally in January 1996. Additional tests were performed to prove that the material remains unchanged.

**Storage:** This Reference Material should be stored in dry place and in environment free from chemical or other aggressive vapours and should be protected against vibration. If the contents become changed (for example oxidized) because of contamination, the whole contents of bottle should be discarded.

Inquiries regarding this Reference Material should be directed to:  
rm@git.lukasiewicz.gov.pl

Approved by  
Director of the Institute

Prof. Dr. Hab. Eng. Adam Zieliński

Certificate issue date: 10 January 2025

Certificate revision history: 10 January 2025 (editorial changes); 12 May 2020 (change of information regarding validity of certification, editorial changes); August 2002 (editorial changes); January 1996 (Original certificate date)