



Application Note AN-T-188

Iron content in iron ore

Fast and accurate analysis according to ISO/TS 2597-4

Iron ores occur in igneous, transformed, or sedimentary rocks. The most widely distributed iron-containing minerals are oxides, such as hematite (Fe_2O_3), magnetite (Fe_3O_4), or limonite ($\text{FeO}(\text{OH}) \cdot n \text{H}_2\text{O}$), but carbonates such as siderite (FeCO_3) are also important.

The total iron content in iron ore plays a central economic role for mining companies. The higher the iron content in the ore, the more profitable the mining operation. Therefore, a fast and

accurate analysis is important to determine the most profitable areas to work.

In this Application Note, the iron determination according to ISO/TS 2597-4 is presented. A sample of iron ore is dissolved in hydrochloric acid at elevated temperatures. Afterwards, the total iron content is determined quickly and accurately by potentiometric titration using the Pt ring electrode and potassium dichromate as titrant.

SAMPLE AND SAMPLE PREPARATION

The method is demonstrated for various iron ore samples. The iron ore is milled until the grain size

is less than 160 μm .

EXPERIMENTAL

This analysis is carried out on a 905 Titrande equipped with a rod stirrer, combined Pt ring electrode, and temperature sensor. Additionally, a heating plate is needed.

Hydrochloric acid, deionized water, and few drops of tin(II) hydrochloride are added to a reasonable amount of prepared sample. The mixture is heated for one hour at 80 ° C, followed by 10 minutes at 95 ° C. Afterwards by visual inspection of a color change, iron(III) is reduced with tin(II) chloride, and then titanium(III) chloride is added with an excess, which is then oxidized.

After cooling the sample down to room temperature, deionized water and an acid mixture (phosphoric acid and sulfuric acid) are added. Then the sample is titrated with standardized potassium dichromate until after the equivalence point.

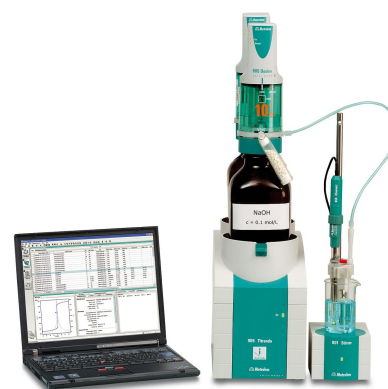


Figure 1. 905 Titrande with tiamo. Example setup for the determination of the iron content in iron ore.

RESULTS

The analysis demonstrates acceptable results and well-defined titration curves. Results are

summarized in **Table 1**. An example titration curve is displayed in **Figure 2**.

Table 1. Mean total iron content of various iron ore samples determined with a Titrande system (n = 4).

Sample	Mean	SD(rel) in %
1	65.11%	0.21%
2	54.25%	0.27%
3	62.81%	0.41%
4	66.78%	0.32%
5	66.18%	0.45%

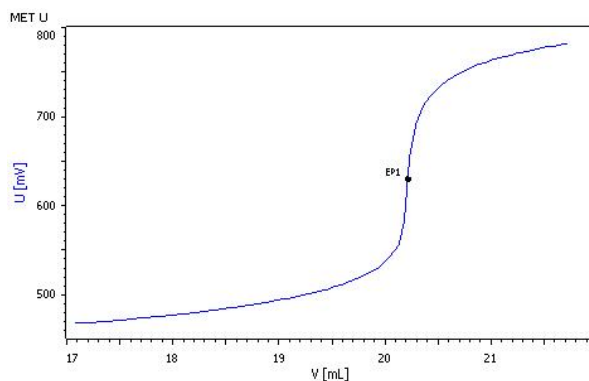


Figure 2. Example titration curve of iron content determination.

CONCLUSION

After sample preparation, the determination of iron content in iron ores can be performed reliably and cost-efficiently by using a Metrohm autotitrator. Fast and precise determination according to **ISO/TS 2597-4** is possible.

The presented method provides an inexpensive and easily performable approach to estimate if an extraction of iron from iron ore is economically feasible or not.

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CONFIGURATION



905 Titrando

Dosino-トーションシステムを用いた用途のための測定インターフェースを備えた電位差滴定のためのハイエンド滴定装置。

- タイフ800 Dosinoのトーションシステムが4つまで
- 変動滴下量当量点滴定 (DET)、等量滴下当量点滴定 (MET)、終点滴定 (SET)
- イオン選択性電極を用いた測定 (MEAS CONC)
- モニタリング、LQHを備えたトーション機能
- 追加スターラーまたはトーションシステムのための4つのMSBコネクタ
- インテリシエント電極「iTrode」
- USB コネクタ
- OMNISソフトウェア、*tiamo*ソフトウェアもしくはTouch Controlを適用
- GMP/GLP基準およびFDA 基準21 CFR Part 11の要件を満たしています(必要な場合)



804 Ti Stand 802 Stirrer

フロヘラスターラ 6.1909.010 を備えるロットスターラ。



804 Ti Stand with stand

Titration stand and controller for 802 Rod Stirrer. The 804 Ti Stand together with the optional 802 Rod Stirrer provides an alternative to the magnetic stirrer. Ti Stand with base plate, support rod and electrode holder.



Pt

セラミックヒンタイアフラム付き複合白金リンク電極。

この電極は、例えば以下のような様々なpH値での酸化還元滴定に適しています：

- Winkler(ウィンクラー)法による酸素含有量
- KMnO_4 を用いた過酸化水素の測定
- シアソ化滴定

参照電解質として、およひ保管用に $c(\text{KCl}) = 3 \text{ mol/L}$ が使用されます。



Pt1000- (12.5 cm)

カラス製Pt1000-温度センサー (クラスB)。

このPt1000-温度センサーは、取り付け長さ17.8cmの製品番号6.1110.110でも入手可能です。