minerals

MDPI

Supplementary Material

Proposition of a Thermogravimetric Method to Measure the Ferrous Iron Content in Metallurgical-Grade Chromite

Marcus Sommerfeld [1*], Bernd Friedrich [1]

[1] IME Process Metallurgy and Metal Recycling, Institute of RWTH Aachen University; 52056 Aachen, Germany; msommerfeld@ime-aachen.de (M.S.); bfriedrich@ime-aachen.de (B.F.)

* Correspondence: msommerfeld@ime-aachen.de; Tel.: +492418095200

1. Raman Measurement

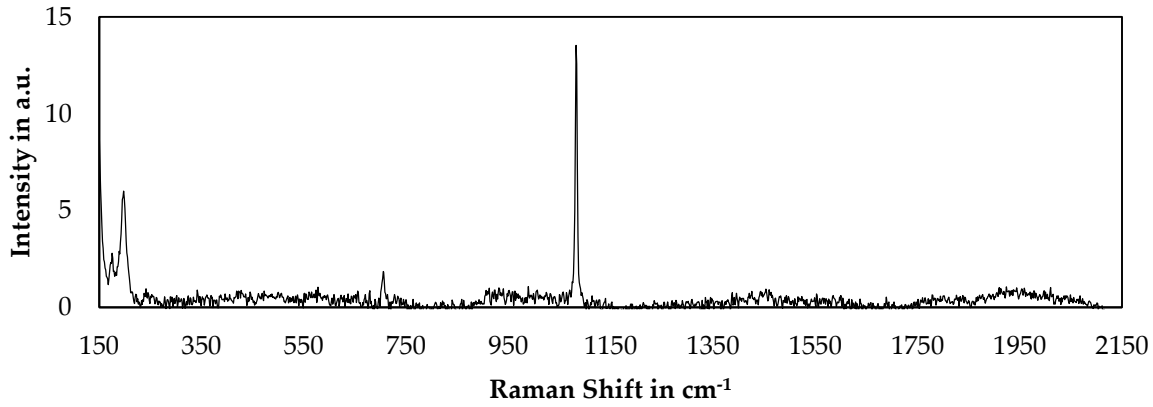

Figure S1. Raman Spectrum: Aragonite.

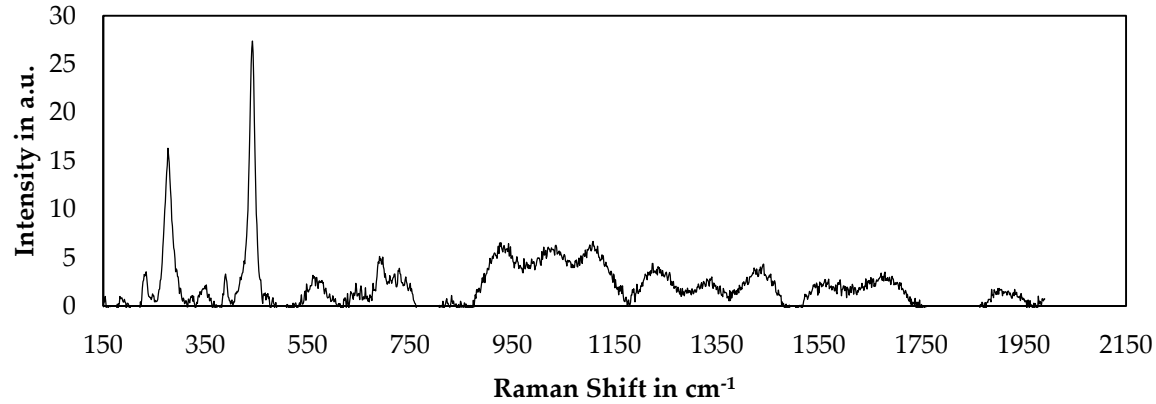

Figure S2. Raman Spectrum: Brucite.

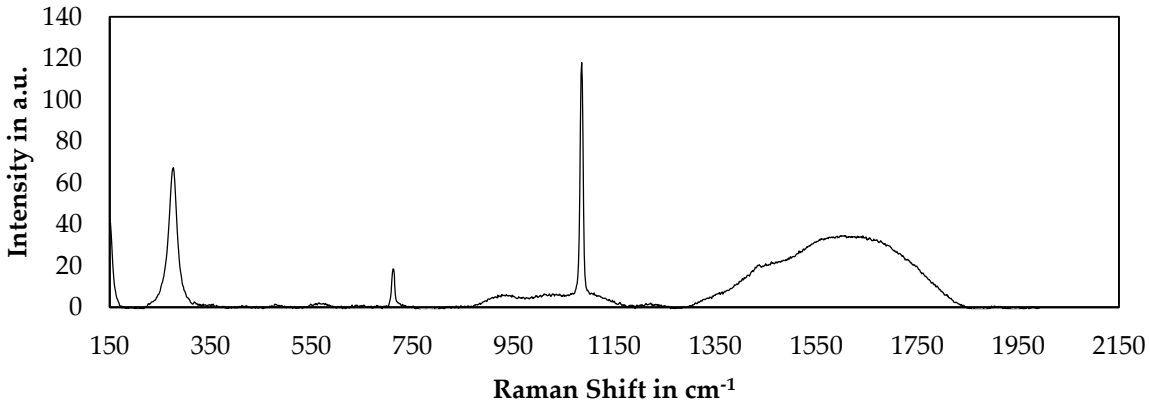

Figure S3. Raman Spectrum: Calcite.

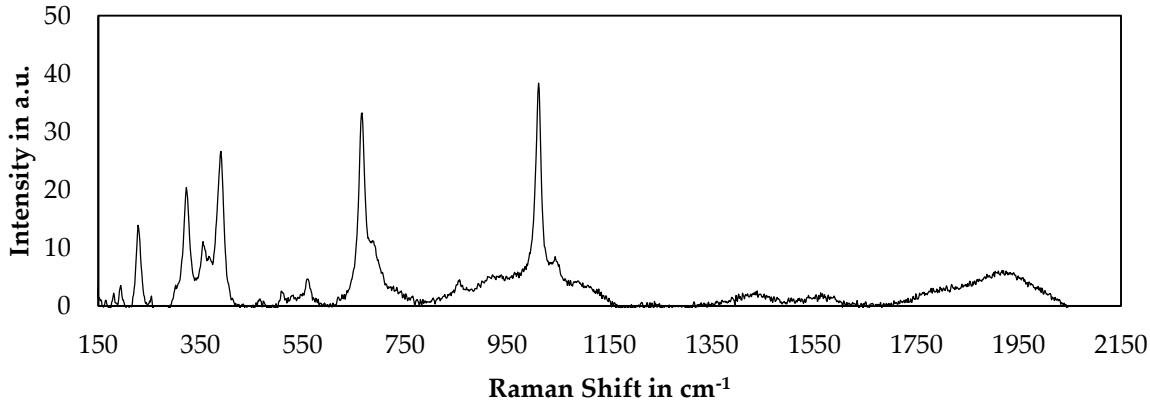

Figure S4. Raman Spectrum: Diopside.

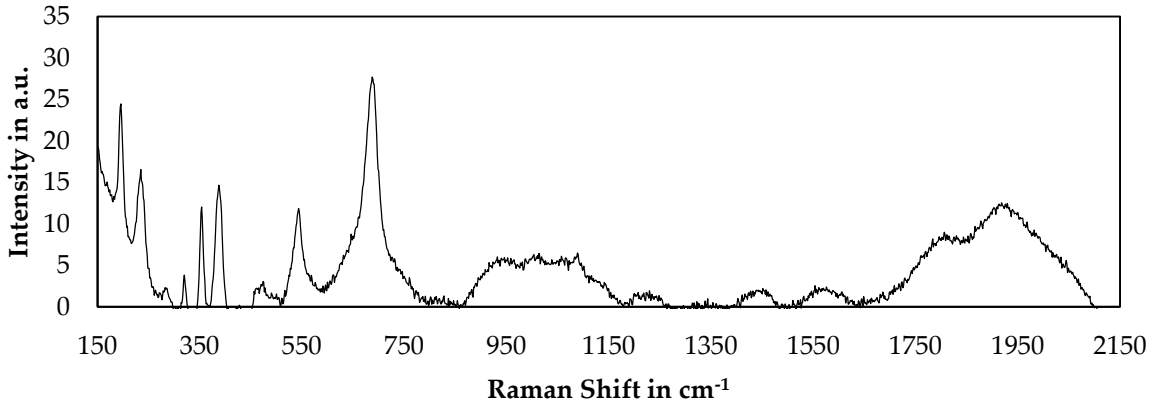

Figure S5. Raman Spectrum: Dozyite.

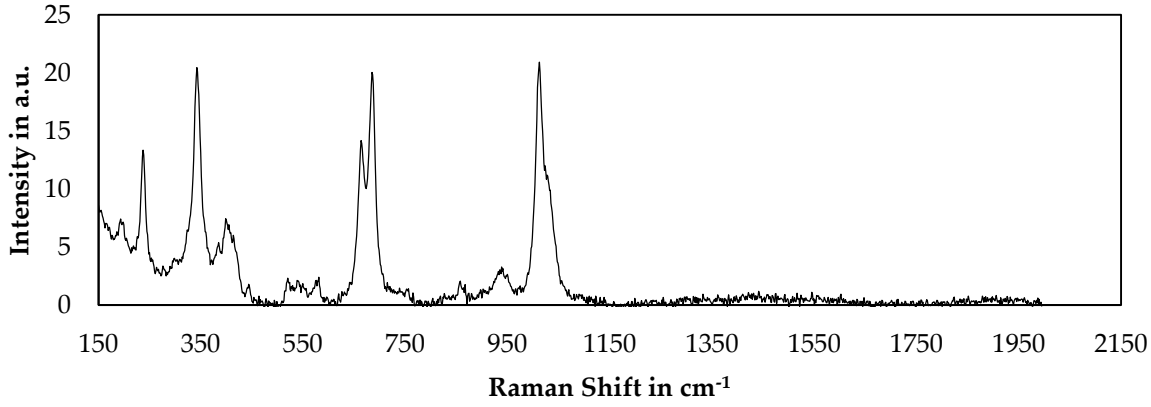

Figure S6. Raman Spectrum: Enstatite.

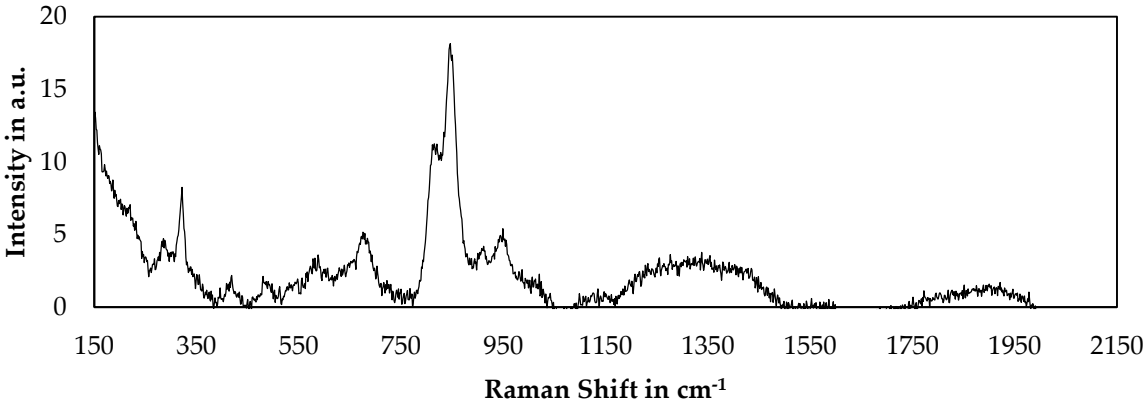

Figure S7. Raman Spectrum: Fayalite.

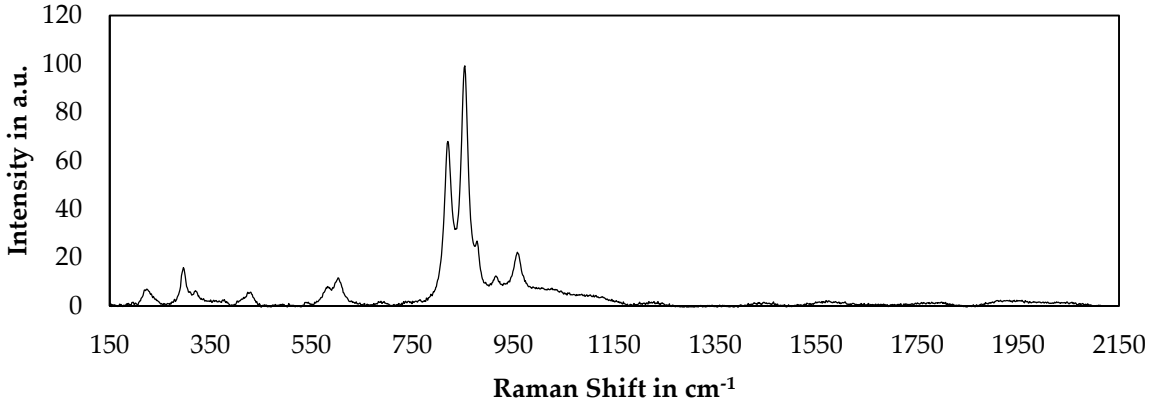

Figure S8. Raman Spectrum: Forsterite.

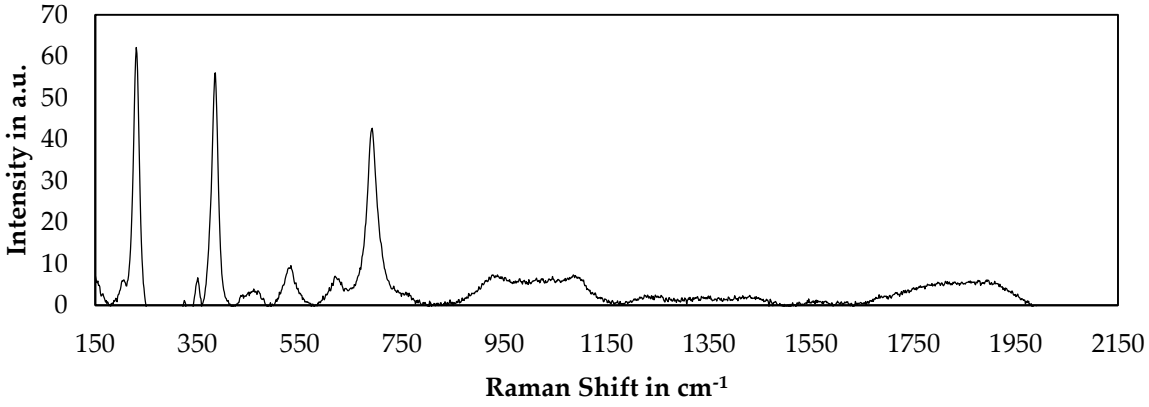

Figure S9. Raman Spectrum: Lizardite.

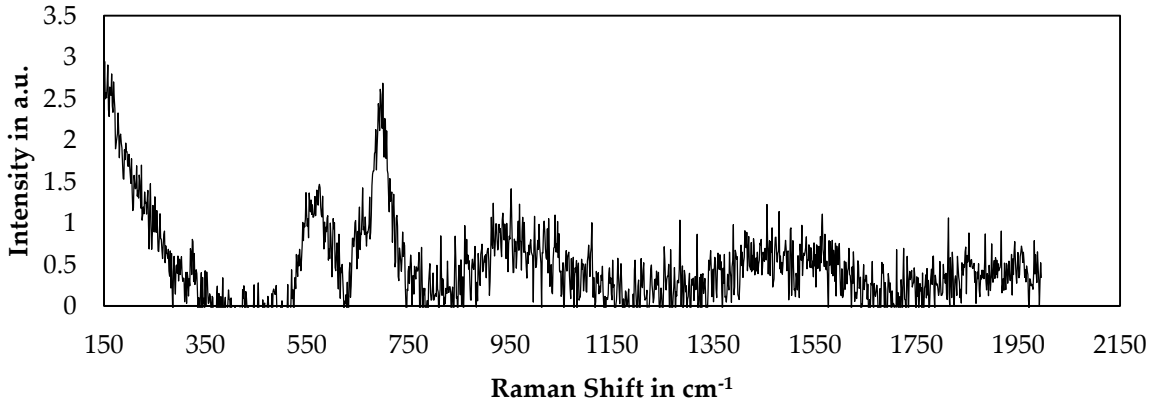

Figure S10. Raman Spectrum: Magnesiochromite.

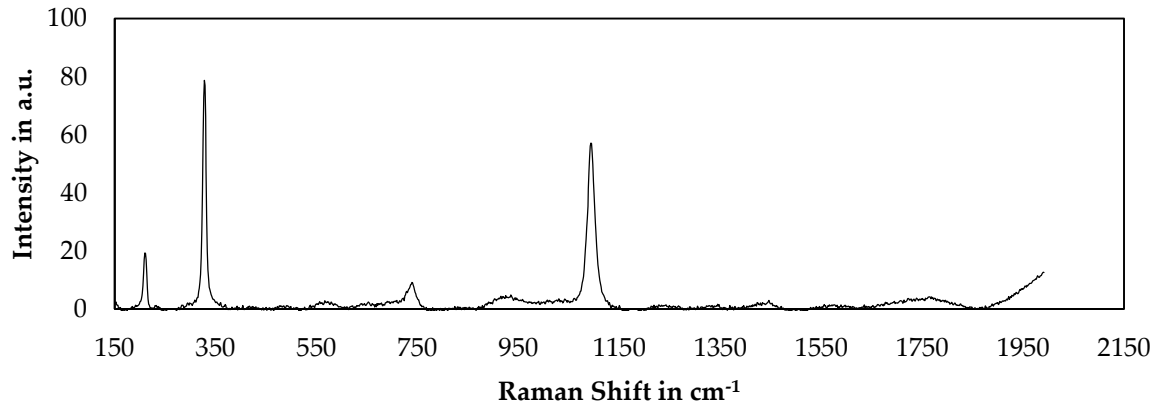

Figure S11. Raman Spectrum: Magnesite.

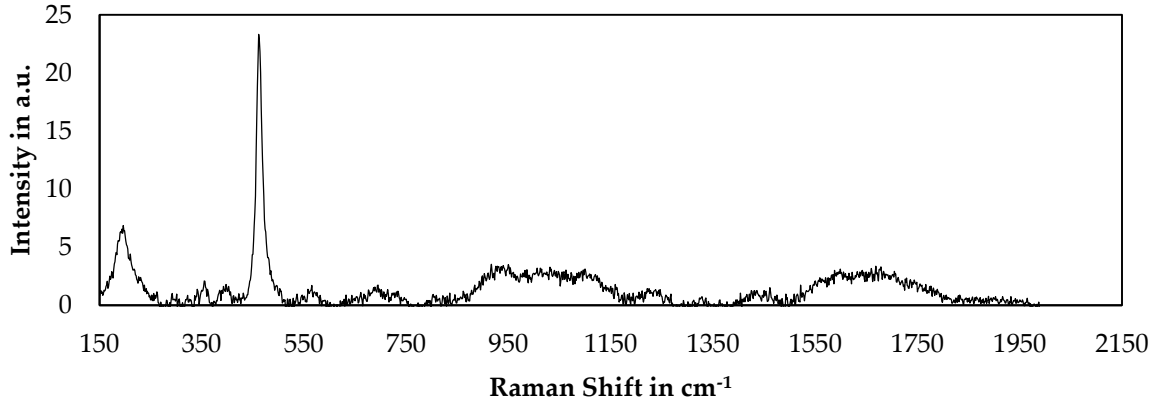

Figure S12. Raman Spectrum: Quartz.

2. QEMSCAN®

Table S1. QEMSCAN® analysis in vol%, wt% and used density for conversion.

Mineral	Content in vol%	Mineral used for conversion	Density in g/cm³	Content in wt%
Chromite	76.05	Chromite	4.79	82.13
Olivine	18.55	Olivine	3.32	13.88
Mg-Chromite	1.64	Mg-Chromite	4.20	1.55
MgAl-Silicate	1.26	Cordierite	2.65	0.75
Brucite	1.17	Brucite	2.39	0.63
Others	0.60	Mean Value	3.39	0.46
Pyroxene	0.28	Enstatite	3.20	0.20
Fe-Oxide	0.20	Magnetite	5.15	0.23
Quartz	0.13	Quartz	2.62	0.08
Calcite	0.07	Calcite	2.71	0.04
Dolomite	0.05	Dolomite	2.84	0.03

3. Trace Elements

Table S2. Concentration of trace elements in the chromite sample according to an ICP-Scan and XRF.

Concentration of Trace Element in ppm					
Element	**Ag**	**Au**	**As**	**B**	**Ba**
ICP-Scan	<10	n.a.	<1	<10	<10
ProTrace XRF	<1	12	5	n.a.	80
Element	**Bi**	**Br**	**Cd**	**Ce**	**Co**
ICP-Scan	<10	n.a.	0.42	n.a.	27.8
ProTrace XRF	3	2	<1	<1	225
Element	**Cu**	**Ga**	**Ge**	**Hf**	**Hg**
ICP-Scan	<10	<10	n.a.	n.a.	n.a.
ProTrace XRF	13	10	<1	<1	<1
Element	**La**	**Li**	**Mo**	**Nb**	**Nd**
ICP-Scan	n.a.	<10	<1	<10	n.a.
ProTrace XRF	53	n.a.	1	<1	<1
Element	**Pb**	**Rb**	**Sb**	**Sc**	**Se**
ICP-Scan	37.9	n.a.	<10	n.a.	<1
ProTrace XRF	30	<1	n.a.	26	<1
Element	**Sn**	**Sr**	**Ta**	**Te**	**Th**
ICP-Scan	<10	<10	<10	<1	n.a.
ProTrace XRF	<1	4	<1	24	<1
Element	**U**	**W**	**Y**	**Yb**	**Zn**
ICP-Scan	n.a.	100	n.a.	n.a.	640
ProTrace XRF	3	117	<1	<1	705

*n.a.: not analyzed

4. Particle Size

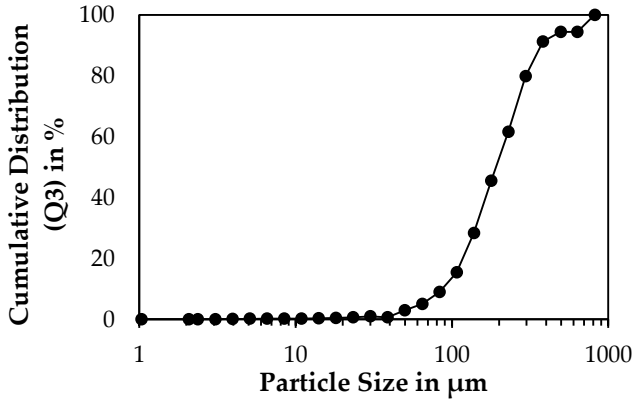

Figure S13. Particle size as determined by dynamic imaging analysis.