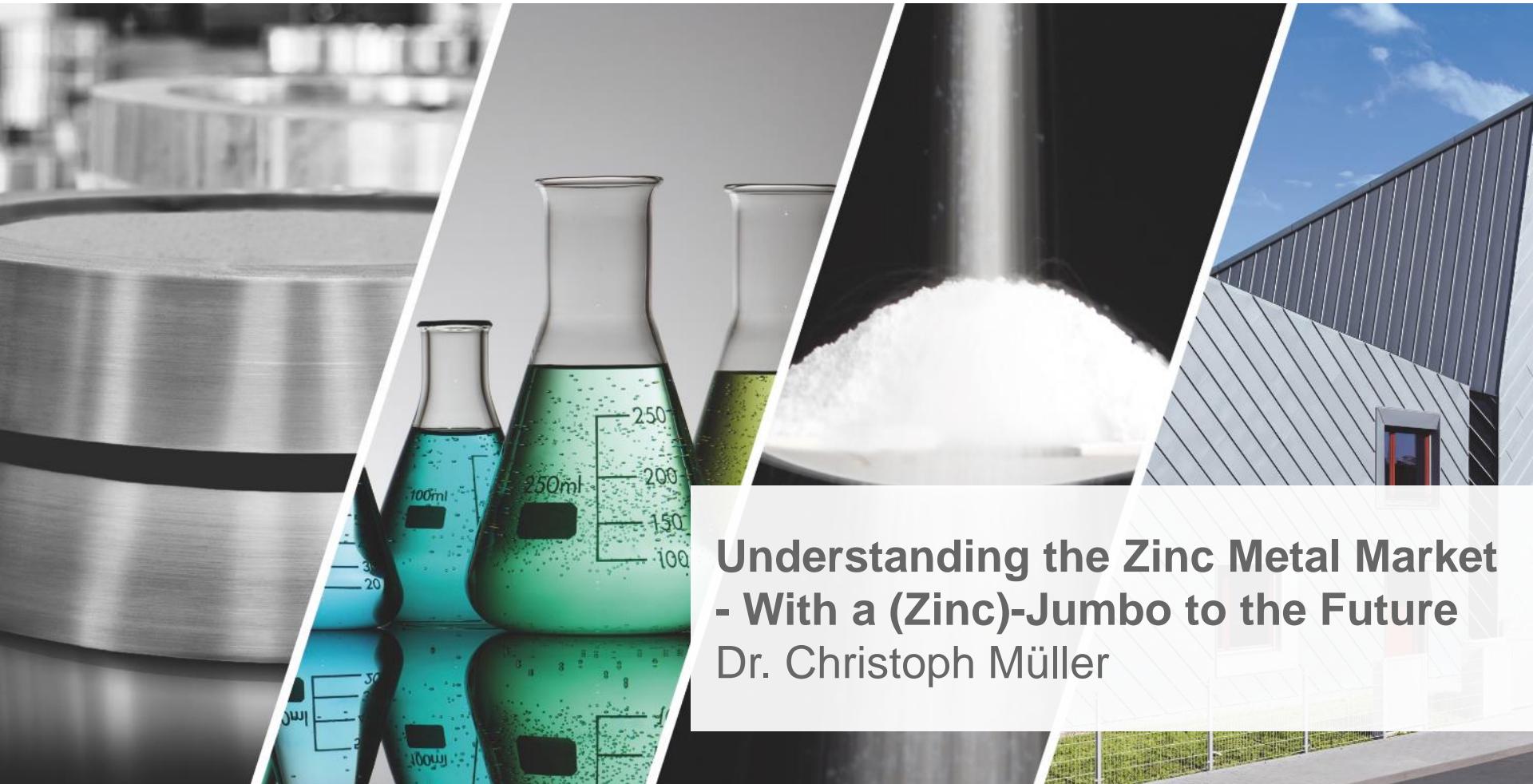


NAATBATT

ZINC BATTERY TECHNOLOGY WORKSHOP V



Understanding the Zinc Metal Market - With a (Zinc)-Jumbo to the Future

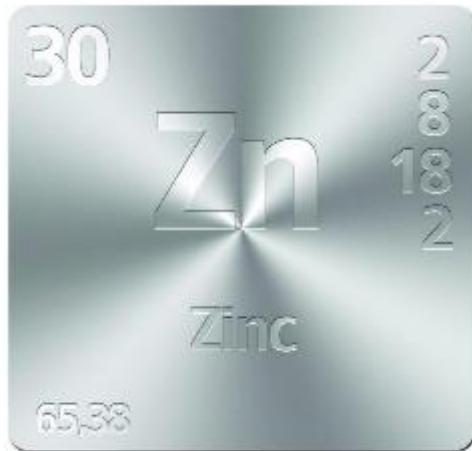
Dr. Christoph Müller

Agenda

- **Where is Zinc coming from?**
- What grades are available?
- Where is Zinc traded?
- How is Zinc traded?
- Inside the market

WHERE IS ZINC COMING FROM?

What is Zinc?



Zinc is the 23rd most abundant element in Earth's crust
(198.000.000 Mt)

Mt = million metric tons

adapted from International Zinc Association (IZA) 2022

**Extractable global resources
63.000 Mt**

- 247 Mt Zinc currently in use
- 247 Mt Proven and Probable reserves
- 20 Mt World zinc use /y
- 12.8Mt Mined zinc /y
- 7.6 Mt Zinc recycled /y

WHERE IS ZINC COMING FROM?

And how is it mined?



Picture: Vlad Chețan

Open-pit mining

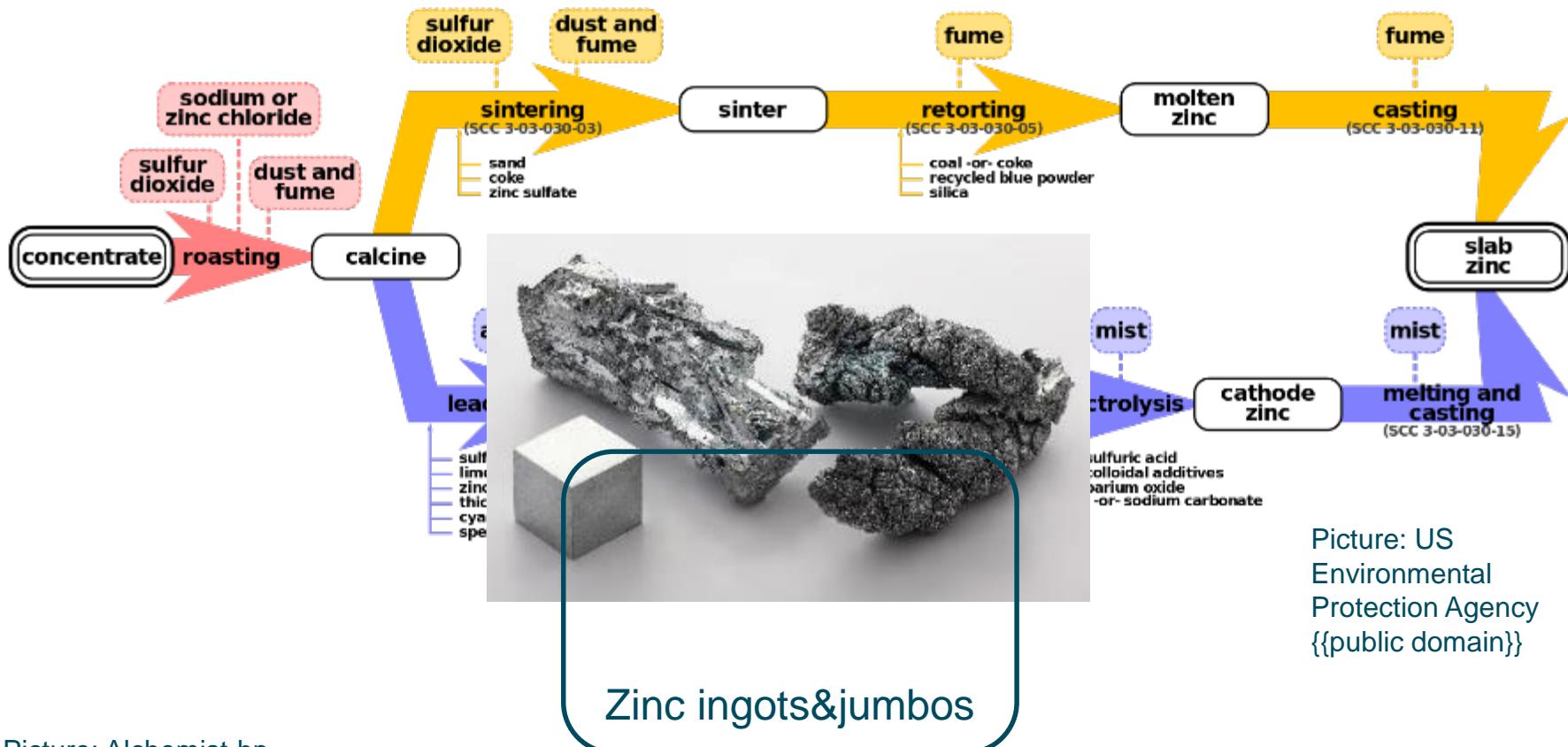


Sphalerite
zinc sulfide

Picture: Ivar Leidus
{CC BY-SA 4.0}

WHERE IS ZINC COMING FROM?

When do we get to the zinc?



Picture: Alchemist-hp
{CC BY-NC-ND 3.0}

Picture: US
Environmental
Protection Agency
{public domain}

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WHAT GRADES ARE AVAILABLE?

International Standards and Specifications?

International Standard for refined Zinc:

“Zinc ingot” ISO 752:2004

(International Organization for Standardization)

“It specifies the classifications. chemical compositions. markings and other requirements for primary zinc.”

Designation	Pb	Fe	Cd	Al	Cu	Sn	Permitted Total	Min. Zn content	Colour Code
ZN-1	0.003	0.001	0.003	0.001	0.001	0.001	0.005	99.995	White
ZN-2	0.003	0.003	0.003	0.002	0.002	0.001	0.010	99.990	Yellow
ZN-3	0.03	0.02	0.01	0.01	0.002	0.001	0.05	99.95	Green
ZN-4	0.45	0.05	0.01	0.01	0.20	-	0.5	99.5	Blue
ZN-5	0.5-1.4	0.05	0.2	0.01	0.1	-	1.5		Black

INTERNATIONAL STANDARDS

Related grades

International Standard for refined Zinc:
“Zinc ingot” ISO 752:2004
(International Organization for Standardization)

- ISO 20081:—1). Zinc and zinc alloys — Method of sampling — Specifications
- AS 1242. Zinc Ingots (Australian Standard)
- ASTM B6. Standard Specification for Zinc (American Society for Testing and Materials)
- EN 1179. Zinc and zinc alloys — Primary zinc (European Standard)
- JIS H 2107. Zinc metal (Japanese Industrial Standard)
- KS D 2351. Zinc metal (Korean National Standards)

RELATED GRADES

What are the differences?

ISO 752	UNS	EN 1179	ASTM B6	JIS H 2107 KS D 2351	AS 1242
ZN-1	Z12002	Z1	LME LME Grade	Highest Pure Zinc Metal	
ZN-2	Z13001	Z2	SHG Special High Grade	Special Zinc Metal	Special High Grade
ZN-3	Z14002	Z3	HG High Grade	Ordinary Zinc Metal 99.97	High Grade
ZN-4	Z16003	Z4	IG Intermediate Grade	Distilled Zinc Metal, Special 99.6	
ZN-5	Z18004	Z5	PWG Prime Western Grade	Distilled Zinc Metal, Class 1 98.5 Distilled Zinc Metal, Class 2 98.0	Prime Western

WHAT DOES THIS HAVE TO DO WITH TRADING ZINC?

Linking physical contracts to a reference price

Zinc for the reference price must meet the following specifications.

Quality:

- BS EN 1179:2003 - 99.995% grade
- ISO 752:2004 - ZN-1 grade
- ASTM B6-18 - LME grade
- GB/T 470-2008 - Zn99.995 grade

Shape: Ingots

Lot size: 25 tonnes

Agenda

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WHERE IS ZINC TRADED?

Commodities exchanges

- **London Metal Exchange (LME)**
 - Highest liquidity, highest relevance.
- **LME Singapore**
 - 5t Zinc minis
- **Chicago Mercantile Exchange (Chicago, New York)**
 - Low liquidity
- **Shanghai Futures Exchange (ShFE)**
 - Difficult to access for non-Chinese companies.
 - Highest liquidity after the LME.

1571 – THE BEFORE TIMES

The Royal Exchange, London

- 1571 opening by queen Elisabeth I.
- 1666 destroyed in the great fire of London
- 1669 resumption of trading
- 1838 2nd fire
- 1844 reopening by queen Victoria



The original Royal Exchange just before the Great Fire of 1666
Public domain



The second Royal Exchange 1751
Public domain



The Royal Exchange around 1910
PD-alt-100 ; Public domain

19TH CENTURY – THE RING IS BORN

The Jerusalem Coffee House, Cornhill, London

“A merchant with metal to sell would draw a circle in the sawdust on the floor and call out ‘Change’, at which point all those wishing to trade would assemble around the circle and make their bids and offers.”



The Ring at the London Metal Exchange

1877 – LME WAS FORMED



Trading Zinc since 1920

- Trading started with copper
- Closed in WWI and in WWII until 1954
- 2010 Opening of outside office LME Singapore
- 2012 Takeover by Hong Kong Exchanges and Clearing
- 15.7 trillion US dollars turnover



Image by Csaba Nagy from Pixabay

- Ring closed in 3/2020 (C19).
- LME switched to electronic pricing.
- Permanent closure?
- Ring reopened in 9/2021.



Kreepin Deth, CC BY 3.0 via Wikimedia Commons
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Agenda

- Where is Zinc coming from?
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HOW IS ZINC TRADED?

Setting the reference price

The Ring (11.40 – 17.00 London time)

- The LME Official Prices are discovered.
 - LME Official Price
 - LME Official Settlement Price
- Only Category 1 members can trade in the Ring.
- Each LME metal is traded in highly liquid five-minute Ring sessions.
 - Ring 1: Zinc 12.10 – 12.15
 - Ring 2: Zinc 12.50 – 12.55 → LME Official Prices
 - Ring 3: Zinc 15.05 – 15.10

LMEselect (01.00 – 19.00 London time)

- LME closing price

Inter-office telephone trading (24 hours)

PREMIUMS AND DISCOUNTS

Deviations from the the reference price

reference price

Premium/discount
shape of the metal

Premium/discount
grade of the metal

Premium/discount
location of delivery
„regional premium“

„All-in“ price =
reference price \pm
premiums/
discounts

Some regional premiums
may be hedged but if this
is not possible this
element is also added to
overall basic risk
„basic risk“

Negotiations

- metal specifications, grade and impurities
- cost, insurance and freight, based on the location the metal is being shipped from/to
- currency conversion
- refinement stage of the material
- shipment month flexibility

Market
participants
can risk-
mitigate this
part of the
all-in price
by hedging

HOW IS ZINC TRADED?

Overview

- **Spot market**

For the impatient
“on the spot” (2 days)



PAY NOW

GET IT NOW

- **Hedging**

Back to the future

Obligation to buy/sell a standard quantity of a specified asset on a set date (up to 63 month) at a specified location at a fixed price agreed today.

- **Monthly Average Settlement Price (MASP)**

The mean thing

Smooths Ups and Downs over a month

PHYSICAL DELIVERY

The jumbo is landing.

- Predetermined delivery date.
- Arranged quantity and quality
- Designated warehouse.
- Bearer receipt changes hands from the seller to the buyer who then makes full payment.
- The buyer arranges the transport.



Jumbos
1000 kg – 4000 kg
Lots
24-25 mt



Ingots
25kg
Bundle
1000kg
Lots
24-25mt

Agenda

- Where is Zinc coming from?
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INSIDE THE MARKET

Looking into the crystal ball



Source: <https://www.mining.com/web/column-zinc-caught-between-weakening-demand-and-sliding-supply/>

WILHELM GRILLO HANDELSGESELLSCHAFT MBH

is a nonferrous (NF) metal trading company with worldwide activities. The company was founded in 1919 as a subsidiary of Aktiengesellschaft für Zinkindustrie, formerly Wilhelm Grillo.

In 1947 Wilhelm Grillo Handelsgesellschaft, under the leadership of Herbert Grillo, stood at the beginning of a longer period of establishing an international nonferrous metal trading business.

Our today's activities focus on the exchange traded metals zinc, copper, lead and tin. Beyond that we are trading in nickel and minor metals as well as secondary metals like remelted zinc, brass, gunmetals and bronzes, partly from own production in Tattendorf, Austria.

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Lead, Tin & Nickel:

Mr. Mike Eggert
Tel.: +49 203 4066 142

Aluminium

Mr. Florian Menzel
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Minor Metals:

Mr. Mike Eggert
Tel.: +49 203 4066 142

Trading program Zinc

- SHG Zinc according to DIN EN 1179
- in slabs and jumbos
- Z1 99,995 % Zn
- Z2 99,99 % Zn
- Z3 99.95 % Zn
- GOB – Zink accordy to DIN EN 1179
- in slabs and jumbos
- Z5 98,5 % Zn
- Remelted Zinc
- Zinc – Aluminium Alloys
- Zinc residues / Zinc scraps
- Hard spelter
- Zincashes
- Zinc top dross
- Old zinc sheet scrap

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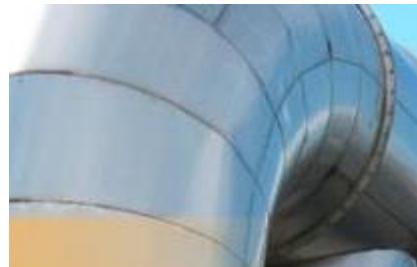
GRILLO GROUP

ADDED VALUE IN 4 DIVISIONS



METAL

- Zinc wires
- Zinc strips
- Zinc powders
- Zinc anodes
- ZAMAK®
- ZEP®
- Grillo-KKS-Beton



CHEMICALS

- Sulphur chemicals
- Acids
- Oxides
- Sulphates
- Sulphites
- Dimethyl ether and dimethyl sulphate
- Zinc sulphates
- Recycling of sulphurous residues



ZINC OXIDE

- Zinc oxide for
- Pharmaceuticals
- Cosmetics
- Dietary supplements
- Textile fibres
- Paints and Varnishes
- Battery technology
- Chemicals
- Adhesives



RHEINZINK

Titanium zinc for applications in architecture

- Roof
- Façade
- Roof drainage
- Indoor applications

THINK ZINC.

Materials & Solutions
for energy storage.

Zinc wire

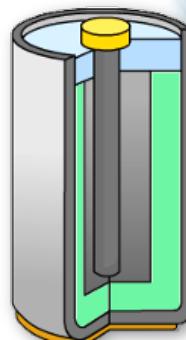


Zinc sulphate



Zinc powder

Zinc oxide



Zinc foil



Porous materials

Grillo – Your global Partner

batteries@grillo.de / zinc.grillo.de/en/

Thank you very much for your attention!

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