

# FLUORINE FORUM 2018

Hotel Wellington, Madrid  
15-17 October 2018



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# ***Bienvenido, Welcome to Madrid***





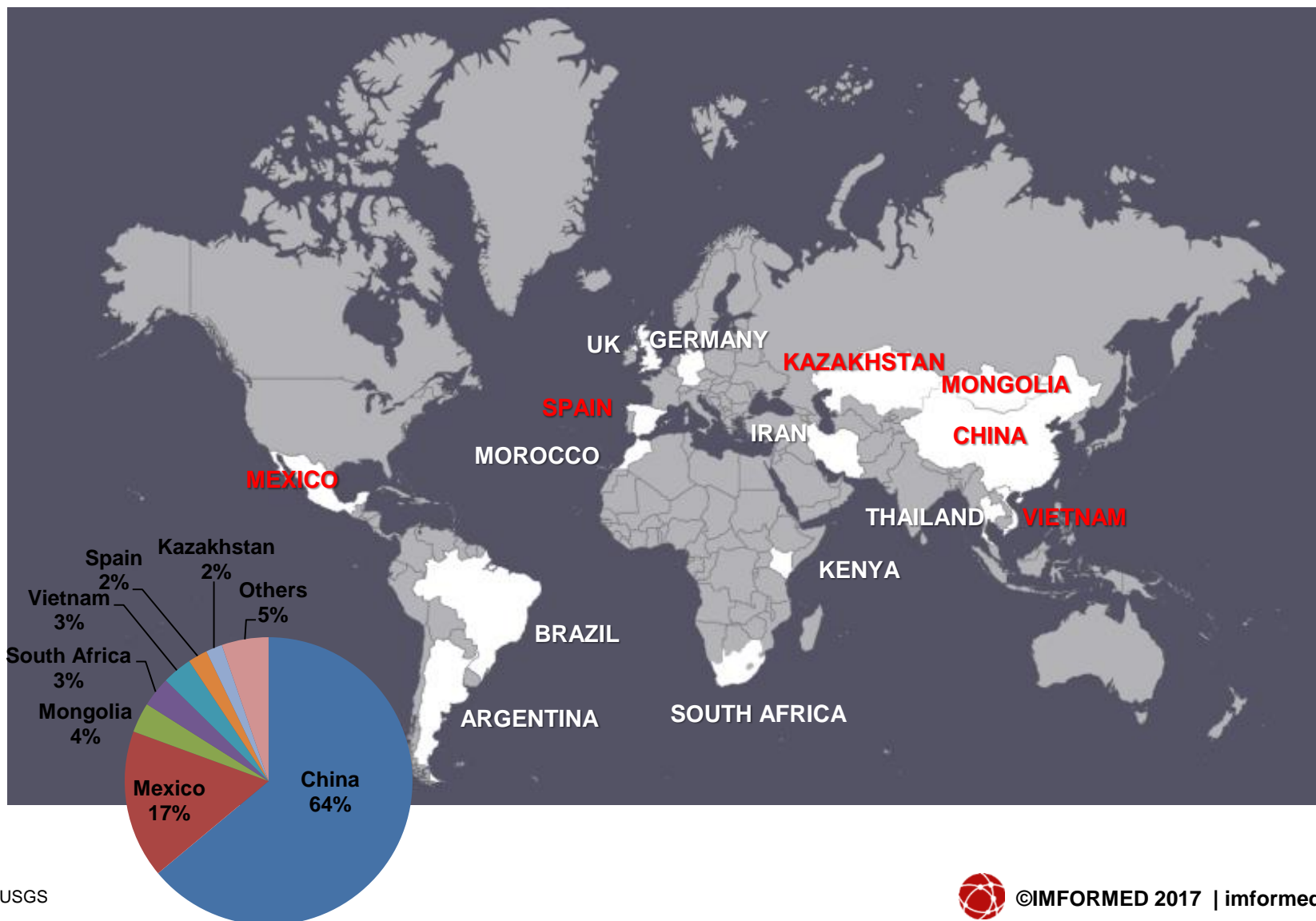
# ***Bienvenido, Welcome to Madrid***



500m

# World fluorspar production

Total 6m tonnes



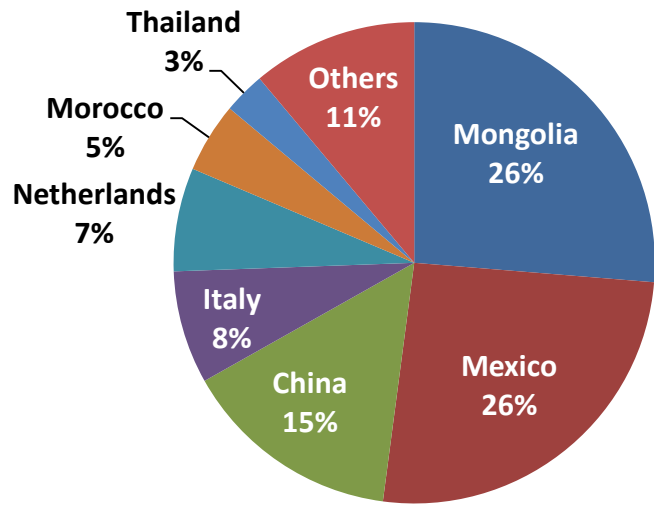
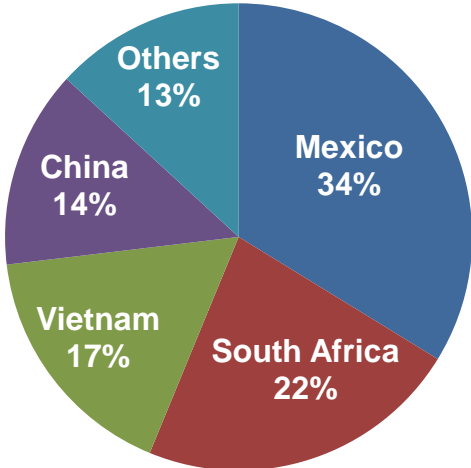
Source: USGS



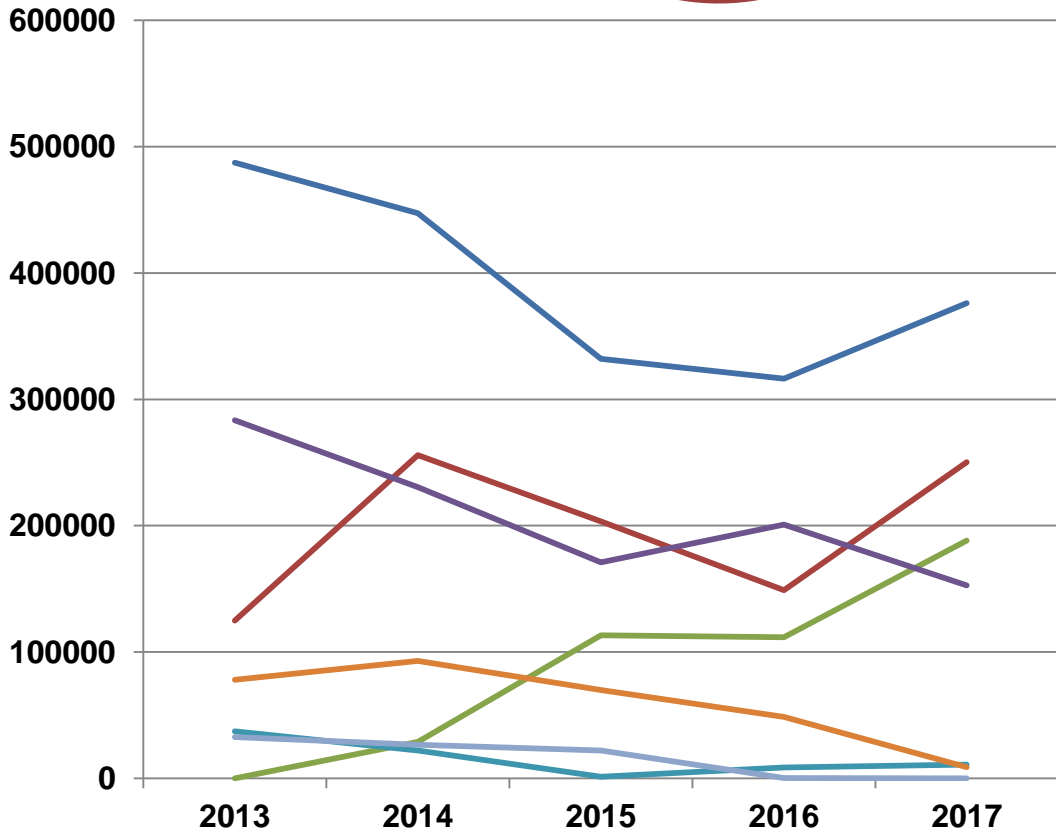
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# World fluorspar trade

Acidspar exports  
1.1m tonnes



Metspar exports  
1.2m tonnes



- Mexico
- South Africa
- Viet Nam
- China
- Mongolia
- Kenya
- Italy

Source: USGS





# World fluorspar production

New and emerging supply sources



## Discussion points

- **Supply outlook**

- “lost” production capacity in recent years – is it a factor?
- metspar scarcity, a reality?
- new wave of potential new fluorspar sources:
  - CFI, SepFluor heading the pack Q1 2019 – but followed by other, smaller operations?
  - ALCORE  $\text{AlF}_3$ , Australia on stream end-2018
- interest in FSA feasibility: OCP project, others?

- **China’s continuing influence**

- supply: impact of recent government measures, diminishing quality reserve concerns
- domestic demand:  $\text{AlF}_3$ , HF, steel growing, a net importer of fluorspar?
- High price period sustainable?

- **Evolving markets**

- more uses for metspar
- evolving cement market
- steel and aluminium demand drivers
- fluorochemicals: HFC phase out & replacements, new hi-tec applications, eg. Li-ion batteries



# Programme – Tuesday Morning

## 08.45 **Welcome & Introduction**

Ismene Clarke, Director & Mike O'Driscoll, Director, INFORMED, UK

### GLOBAL TRADE | CHINA

## 09.15 **International trade developments in the fluorspar market**

Kerry Satterthwaite, Division Manager – Carbon & Chemicals, Roskill Information Services Ltd, UK

### 09.45 COFFEE

### LOGISTICS

## 10.45 **How the fluorine industry can use freight to its advantage**

Denny Sabah, Mining and Dry Bulk Analyst, Clarksons Platou Shipbroking, UK

## 11.15 **Fluorspar logistics and the rising mineral hub of the Port of Amsterdam**

Robert van Muiden, Business Development, OBA Bulk Terminal Amsterdam, the Netherlands

### KEYNOTE PANEL DISCUSSION

## 11.45 **Fluorine Market Outlook**

Mike O'Driscoll, Moderator

Panellists: **Oliver Rhode**, XENOPS Chemicals GmbH & Co. KG  
**Ray Will**, IHS Markit

### 12.30 LUNCH





# Programme – Tuesday afternoon

## STEEL | FLUOROCHEMICALS

### 14.00 Steel market outlook

Alfonso Hidalgo de Calcerrada García, Chief Economist, UNESID, Spain

### 14.30 Developments in downstream fluorochemicals consumption

Ray Will, IHS Markit Ltd, Director Chemical Consulting, Specialty and Inorganic Chemicals, USA

## 15.00 COFFEE & ROUNDTABLE NETWORKING

| Table No. | Theme                            | Table Host  |
|-----------|----------------------------------|---|
| 1         | China: Market Influence          | Kerry Satterthwaite, Roskill Information Services |
| 2         | New/Alternative Sources/Projects | Oliver Rhode, XENOPS Chemicals GmbH & Co. KG      |
| 3         | Mining & Processing              | Peter Robinson, British Fluorspar Ltd             |
| 4         | Shipping & Logistics             | Denny Sabah, Clarksons Platou Shipbroking         |
| 5         | Fluorochemicals Outlook          | Ray Will, IHS Markit                              |

## 17.00 CLOSE OF DAY 1 & DRINKS RECEPTION





Also new for this year...

## Roundtable Networking Session 15.00-17.00 Tuesday

**PLEASE PRE-ASSIGN YOUR PLACE AT THE TABLES OF YOUR CHOICE  
AT THE CONFERENCE REGISTRATION DESK BEFORE 15.00 TUESDAY**

| Table No. | Theme                                | Host  |
|-----------|--------------------------------------|---|
| 1         | China: Market Influence              | Kerry Satterthwaite,<br><i>Roskill Information Services</i> |
| 2         | New/Alternative Sources/<br>Projects | Oliver Rhode, XENOPS<br><i>Chemicals GmbH &amp; Co. KG</i>  |
| 3         | Mining & Processing                  | Peter Robinson,<br><i>British Fluorspar Ltd</i>             |
| 4         | Shipping & Logistics                 | Denny Sabah,<br><i>Clarksons Platou Shipbroking</i>         |
| 5         | Fluorochemicals Outlook              | Ray Will,<br><i>IHS Markit</i>                              |





# Programme – Wednesday Morning

## ALTERNATIVE SOURCES | $\text{AlF}_3$ | RECYCLING

- 09.00 **Small scale fluorspar processing: the new generation**  
Peter Robinson, Chairman, British Fluorspar Ltd, UK
- 09.30 **The importance of  $\text{AlF}_3$  quality and consistency**  
Anna Lindström, Sales and Marketing Director, Alufluor AB, Sweden
- 10.00 **Fluorine recovery in converting SPL wastes into reusable materials**  
Massimo Maccagni, R&D Manager, Engitec Technologies SpA, Italy

## 10.30 COFFEE

## PROCESSING

- 11.00 **Sulphuric acid as a cost factor in fluorspar processing: supply and demand trends**  
Freda Gordon, Director, Acuity Commodities, UK
- 11.30 **The new generation of fluorspar flotation collectors**  
Alexej Michailovski, BASF Mining Solution - Global Lead Flotation (non-Sulfidic), BASF SE, Germany
- 12.00 **Hydrofluoric acid utilisation in High Purity Quartz processing**  
**Dr Sebastian Prinz, Business Development Director, Dorfner ANZAPLAN, Germany**

## 12.30 LUNCH





# Programme – Wednesday Afternoon

## SPAIN | SOUTH AFRICA

- 14.00 **Spain's fluorspar resources, production & markets**  
Manuel Regueiro, Chief of External Affairs & Communication, Geological Survey of Spain, Spain
- 14.30 **Fluorspar in South Africa and SepFluor's Nokeng operation and objectives**  
Kevin Dabinett, General Manager & Johan Brits, Project Director, Robert Wagner, CEO SepFluor, South Africa
- 15.00 **China's fluorine market: production, exports, technology, prices, & outlook**  
Usman Khan, CEO, CCM Information, China
- 15.30 Close of Conference



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ArcelorMittal Purchasing  
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Arkema Inc.  
BAL-CO Spa  
BASF Mining Solution  
British Fluorspar Ltd  
Bus ChemTech AG  
Canada Fluorspar Inc  
Carl Spaeter GmbH  
CCM & Tranalysis  
Central Glass Co. Ltd  
Chemours  
Delta Minerals Ltd  
Derivados del Fluor  
Dorfner Anzaplan  
Engitec Technologies S.p.A  
EuroChem Trading Russia  
Eurolinex GmbH  
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Mongolrostsvetmet LLC  
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Nutrien

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Scheruhn Industries  
Seaforth Mineral & Ore Co  
SepFluor Ltd  
Shanghai Minmetals Develop. Ltd  
Sojitz Corporation  
Solvay Fluor GmbH  
Solvay Specialty Polymers  
Steel Services Sàrl  
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The Cumberland Group  
The Quartz Corp  
Traxys  
Traxys Cometals Europe  
UNESID  
Vergenoeg Mining Company  
Xenops Chemicals GmbH & Co. KG





***Excellent venue and good location, good content and time allowed for presentations***

James Feorino Jr, Strategic Sourcing Manager, Arkema Inc., USA

***Good programme, excellent organisation with a lot of attention to detail; one of the best conference apps I've seen.***

Freda Gordon, Director, Acuity Commodities, UK

***Good interaction between participants in programme and roundtables, knowledgeable and professional organisation.***

Tony Fitzgerald, Director Sales & Marketing, Masan Resources, Vietnam

***Excellent programme and roundtables; great organisation, you really gave the fluorine industry a place and promotion it deserves.***

Aditya Newalkar, Executive Director, Maharashtra Minerals Corp., India

***In-depth information and excellent location, very good mobile app.***

Pandathil Sreedharan Haridas, Sr Vice President, Navin Fluorine International Ltd, India

***Good programme, and excellent roundtables where participants were able to engage with each other; deeply impressed with organisation precision throughout.***

Fumi Gqiba, SA Fluorite (Pty) Ltd, South Africa

***Good experience for meeting business partners, excellent roundtables and good organisation.***

Yondon Golen, Deputy General Director Production, Mongolroostsvetmet LLC, Mongolia

***Roundtables were a very good addition, excellent programme, venue, organisation, and mobile app.***

Malcolm Crawford, Managing Director, Delta Minerals Ltd, UK



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  - Refractory Minerals
  - China
  - Mineral Recycling
  - Fluorine
  - Logistics
  - Oilfield Minerals



### OILFIELD MINERALS & MARKETS **FORUM** Middle East 2018

InterContinental Regency, Bahrain, 5-7 February 2018

### MINERAL RECYCLING **FORUM** 2018

Radisson Blu Hotel, Cologne, 15-16 March 2018

Secondary raw material sources, supply,  
processing, and markets

### OILFIELD MINERALS & MARKETS **FORUM** HOUSTON 2018

Hilton Houston Post Oak, Houston, 6-8 May 2018

### MAG**FORUM** 2018

Magnesium Minerals & Markets Conference  
Grand Elysée Hotel, Hamburg — 17-19 June 2018

### CHINA REFRACTORY & ABRASIVE MINERALS **FORUM** 2018

Regal International East Asia Hotel, Shanghai, 10-12 September 2018

### FLUORINE **FORUM** 2018

Hotel Wellington, Madrid  
15-17 October 2018



MINERAL RECYCLING  
**FORUM** 2019

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OILFIELD MINERALS  
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HOUSTON 2019   
Hilton Houston Post Oak, Houston, 10-12 June 2019

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# MINERAL MARKET MATRIX

## AT A GLANCE A-Z GUIDE WHICH MINERALS FOR WHICH MARKETS

| MINERAL<br>"Derivative"<br>Synthetic | MARKETS* |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | MINERAL<br>"Derivative"<br>Synthetic | MAIN RAW MATERIAL FEEDSTOCKS†   | KEY SPECIFIED<br>CHEMICAL<br>COMPONENTS‡  | WORLD<br>PRODUCTION¶ | MAIN SOURCE<br>COUNTRIES§             |
|--------------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------------------------------|---|---|----------------------|---------------------------------------|
|                                      | Alumina  | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate | Aluminate |                                      |   |   |                      |                                       |
| ALUMINA                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ALUMINA                              | Bauxite   | Al <sub>2</sub> O <sub>3</sub>  | 6,000                | China, USA, Germany                   |
| ANDALUSITE                           |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ANDALUSITE                           | Stibnite  | Al <sub>2</sub> O <sub>3</sub>  | 300                  | South Africa, France, Peru            |
| ANTIMONY TRIOXIDE                    |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ANTIMONY TRIOXIDE                    | Chrysolite  | SnO <sub>2</sub>  | 10                   | China, Russia, Tajikistan             |
| ASBESTOS                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ASBESTOS                             |   | n.a.  | 20,000               | Russia, China, Brazil                 |
| ATTAPULGITE                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ATTAPULGITE                          |   | n.a.  | 2,220                | USA, Senegal, Spain                   |
| BADDELEYITE                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | BADDELEYITE                          |   | ZrO <sub>2</sub>  | 9                    | Russia                                |
| BARITE (BARIUM)                      |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | BARITE (BARIUM)                      |   | BaSO <sub>4</sub>   | 972                  | China, India, Morocco                 |
| BAUXITE                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | BAUXITE                              |   | Al <sub>2</sub> O <sub>3</sub>  | 10,000               | China, Guyana, Greece                 |
| BENTONITE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | BENTONITE                            | (also Hectorite serves similar markets)                                       | n.a.  | 17,500               | USA, China, India                     |
| BORAX                                |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | BORAX                                | Borax, Colemanite, Kernalite, Ulexite   | B <sub>2</sub> O <sub>3</sub>   | 850,220,000          | Turkey, USA, China                    |
| BROMINE                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | BROMINE                              | Bitumens, Seawater, Salt lakes  | n.a.  | 750                  | Israel, USA, Jordan                   |
| CALCIUM CARBONATE                    |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | CALCIUM CARBONATE                    | Limestone, Dolomite, Marble, Chalk  | CaCO <sub>3</sub>   | 102,000,000          | Global                                |
| CELESTITE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | CELESTITE                            |   | SRIO <sub>2</sub>   | 250                  | China, Spain, Mexico                  |
| CHROMITE                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | CHROMITE                             |   | Cr <sub>2</sub> O <sub>3</sub>  | 1,000                | South Africa, Turkey, Oman            |
| DIAMOND (INDUSTRIAL)                 |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | DIAMOND (INDUSTRIAL)                 |   | n.a.  | (in carats 60*)      | DR Congo, Russia, Australia           |
| DIATOMITE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | DIATOMITE                            |   | SiO <sub>2</sub>  | 2,000                | USA, China, Denmark                   |
| DOLOMITE                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | DOLOMITE                             |   | CaO MgO   | 12,000,000           | Global                                |
| FELDSPAR                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | FELDSPAR                             |   | Al <sub>2</sub> O <sub>3</sub> , K <sub>2</sub> O, Na <sub>2</sub> O                | 23,000               | Turkey, Italy, China                  |
| FLUORSPAR                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | FLUORSPAR                            |   | CaF <sub>2</sub>  | 6,250                | China, Mexico, Mongolia               |
| GARNET                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | GARNET                               |   | n.a.  | 1,600                | India, China, Australia               |
| GRAPHITE                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | GRAPHITE                             |   | C   | 700                  | China, Brazil, India                  |
| GYPSEUM                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | GYPSEUM                              | Anhydrite   | CaSO <sub>4</sub>   | 246,000              | China, USA, Iran                      |
| HEMIMORPHITE                         |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | HEMIMORPHITE                         |   | TiO <sub>2</sub>  | 6,600                | Australia, South Africa, China        |
| IODINE                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | IODINE                               | Bitumens, Caliche nitrate   | n.a.  | 52                   | China, Japan, USA                     |
| IRON OXIDE                           |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | IRON OXIDE                           | Hematite, Goethite, Magnetite, Microscopic IO, Ochre, Umber                   | Fe <sub>2</sub> O <sub>3</sub>  | 17,000               | India, Pakistan, Spain                |
| KALIN                                |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | KALIN                                | Kalinite, Halloysite  | Al <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub>                                   | 44,000*              | USA, Germany, China                   |
| KYANITE                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | KYANITE                              |   | Al <sub>2</sub> O <sub>3</sub>  | 92                   | USA, India, Brazil                    |
| LIME                                 |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | LIME                                 | Limestone, Dolomite, Chalk  | CaO   | 350,000              | China, USA, India                     |
| LITHIUM                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | LITHIUM                              | Spodumene, Petalite, Lepidolite, Bitumens, Salt lakes, Hectorite, Zinnwaldite | Li <sub>2</sub> CO <sub>3</sub> , Li <sub>2</sub> Cl <sub>2</sub> , CO <sub>2</sub> | 1,000,000            | Australia, Chile, China               |
| MAGNESITE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | MAGNESITE                            |   | MgCO <sub>3</sub>   | 25,000               | China, Russia, Turkey                 |
| MAGNESIA*                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | MAGNESIA*                            | Magnetite, Serpentine, Brocote, Dolomite, Seawater, Bitumens                  | MgO   | 12,000               | China, Russia, Turkey                 |
| MANGANESE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | MANGANESE                            | Pyrolusite, Psilomelane   | Mn <sub>2</sub> O <sub>3</sub>  | 2,000                | China, South Africa, Australia        |
| MICA                                 |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | MICA                                 | Muscovite, Phlogopite   | n.a.  | 1,000                | China, Russia, USA                    |
| MULLITE*                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | MULLITE*                             | Alumina, Bauxite, Kalite, Kyante, Pyrophyllite                                | Al <sub>2</sub> O <sub>3</sub>  | 1,000                | USA, China, Brazil                    |
| NEPHELINE SYENITE                    |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | NEPHELINE SYENITE                    |   | Al <sub>2</sub> O <sub>3</sub> , K <sub>2</sub> O, Na <sub>2</sub> O                | 5,600                | Russia, Canada, Norway                |
| NITRATES                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | NITRATES                             | Caliche ore, Nitrate  | NaNO <sub>3</sub>   | 550                  | Chile                                 |
| OLIVINE                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | OLIVINE                              | Dunite, Serpentine  | MgO   | 8,000                | Norway, Japan, Spain                  |
| PERILLITE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | PERILLITE                            |   | n.a.  | 3,800                | China, Greece, Turkey                 |
| PHOSPHATE                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | PHOSPHATE                            | Phosphogite   | P <sub>2</sub> O <sub>5</sub>   | 220,000              | China, Mexico, USA                    |
| POTASH                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | POTASH                               | Carminite, Kambite, Langbeinite, Sylvite                                      | K <sub>2</sub> O  | 36,000               | Canada, Russia, Belarus               |
| PUMICE                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | PUMICE                               |   | n.a.  | 17,000               | Turkey, Italy, Saudi Arabia           |
| PYROPHYLITE                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | PYROPHYLITE                          |   | SiO <sub>2</sub>  | 250                  | USA, China, Norway                    |
| QUARTZ                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | QUARTZ                               | Bitumens, Monazite, Xenotime, Ionic clays                                     | SiO <sub>2</sub>  | 1,000                | China, Australia, USA                 |
| RARE EARTHS                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | RARE EARTHS                          |   | RE oxides   | 800,000              | China, Australia, USA                 |
| RUTILE                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | RUTILE                               |   | TiO <sub>2</sub>  | 800                  | Australia, Sierra Leone, South Africa |
| SALT                                 |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SALT                                 | Halite  | NaCl  | 269,000              | China, India, USA                     |
| SEPOLITE                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SEPOLITE                             |   | n.a.  | 600                  | Spain, Turkey, USA                    |
| SILICA SAND                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SILICA SAND                          | Quartz  | SiO <sub>2</sub>  | 200,000              | China, USA, Italy                     |
| SILICON CARBIDE**                    |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SILICON CARBIDE**                    | Silica-Coke   | SiC   | 1,000                | China, Norway, Japan                  |
| SILLIMANITE                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SILLIMANITE                          |   | Al <sub>2</sub> O <sub>3</sub>  | 62                   | India                                 |
| SPINEL*                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SPINEL*                              | Magnesia-Alumina  | MgO, Al <sub>2</sub> O <sub>3</sub>   | 100,000              | China, Germany, USA                   |
| SODA ASH                             |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SODA ASH                             | Trona, Nabalite   | Na <sub>2</sub> CO <sub>3</sub>   | 14,000               | USA, Turkey, China                    |
| SODA ASH*                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SODA ASH*                            | Salt-Limestone-Coke   | Na <sub>2</sub> CO <sub>3</sub>   | 37,000               | China, Russia, Germany                |
| SODIUM SULPHATE                      |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SODIUM SULPHATE                      | Muscovite, Thauvite   | Na <sub>2</sub> SO <sub>4</sub>   | 8,000*               | China, Spain, Mexico                  |
| SULPHUR                              |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | SULPHUR                              | Pyrites, Recovered as by-product, Native sulphur                              | S   | 60,000*              | China, USA, Russia                    |
| TALC                                 |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | TALC                                 |   | n.a.  | 6,000                | China, India, USA                     |
| VERMICULITE                          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | VERMICULITE                          |   | n.a.  | 400                  | South Africa, USA, China              |
| WOLLASTONITE                         |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | WOLLASTONITE                         |   | n.a.  | 1,000                | China, India, USA                     |
| ZEOCLITE*                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ZEOCLITE*                            | Chlorite, Chabazite, Montmorillonite  | n.a.  | 3,000                | China, South Korea, USA               |
| ZIRCON                               |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ZIRCON                               |   | ZrO <sub>2</sub>  | 1,000                | Australia, South Africa, China        |
| ZIRCONIA*                            |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           | ZIRCONIA*                            | Zircon, Baddeleyite   | ZrO <sub>2</sub>  | 200                  | China, USA, Japan                     |

\* Used to produce various products, and sometimes various products, which are listed for their non-synthetic use.

\*\* Used to produce various products, and sometimes various products, which are listed for their non-synthetic use.

† Main raw material feedstocks for the production of various products, which are listed for their non-synthetic use.

‡ Key chemical components for the production of various products, which are listed for their non-synthetic use.

§ Main source countries for the production of various products, which are listed for their non-synthetic use.

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- Leading industrial minerals
- Main raw material feedstock
- Key specified chemical component
- World production
- Main source countries
- Leading consuming markets

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