Rhenium (source wikipedia)

Rhenium (atomic number 75, atomic weight 186.2) is a group 7 (manganese group) transition metal. With a crustal abundance of 1ppb, it is one of the rarest elements on earth. It has one of the highest densities, boiling points and melting points of all metals. Notably, Rhenium has only one stable isotope Re^{185} which occurs in minority abundance, meaning all chemically refined naturally rhenium is radioactive. The isotopic composition of natural rhenium is 37.4% Re^{185} and 62.6% Re^{187}(half-life 10^{10}years) . A kilogram will emit 1.07 MBq of low-energy beta radiation.

0.1 Uses

Rhenium is a miracle metal and is indispensible for its use in superalloys. Nickel-based Rhenium superalloys are used in combustion chambers, turbine blades and exhaust nozzles of jet engines aircraft (ex. F-15, F-16, F-22, F-35 aircraft) and industrial gas turbines. These alloys may contain up to 6 w% Re and comprise its largest use (70%).

Rhenium is also used as a catalyst esp for hydrogenation and isomerization. This industrial use contributed to the volatility in price. In 2008 prices attained a historic high of 10,800 USD/kg before dropping to $2,844 USD/kg in 2018 due to metal recycling and a general drop in demand for rhenium-based catalysts. Pt-Re catalysts are used in the production of Pb-free high-octane gasolines. About 14% of the consumption is related to catalysts.

Rhenium also improves high-temperature stability and ductility of tungsten. One application of W-Re alloys is their use as x-ray emission sources. The high atomic mass and overall resistance makes them stable against prolonged electronic bombardment.

The unstable radioisotopes of rhenium have found use in the treatment of various cancers.

0.2 Occurrence

It occur in small quantities in molydenum and copper ores. It occurs in amounts up to 0.2% in molybdenite the major commercial source. Mineral occurences of rhenium are exceptionally rare. 80% of the production arises from molybdenum porphyry deposits.

0.3 Production

World production is 40-50 tonnes annually, which the major producers being Chile, USA, Peru and Poland. It may be possible to extract rhenium from uranium ore leaches. Given the limited supply and increased demand for the metal, materials scientists have developed superalloys with lower rhenium content. The market is aboyut $530 MUSD in 2022 with projected growth of 4.84% until 2032 [2]

This metal is one of the few geo-strategically important metals not under the control of China.

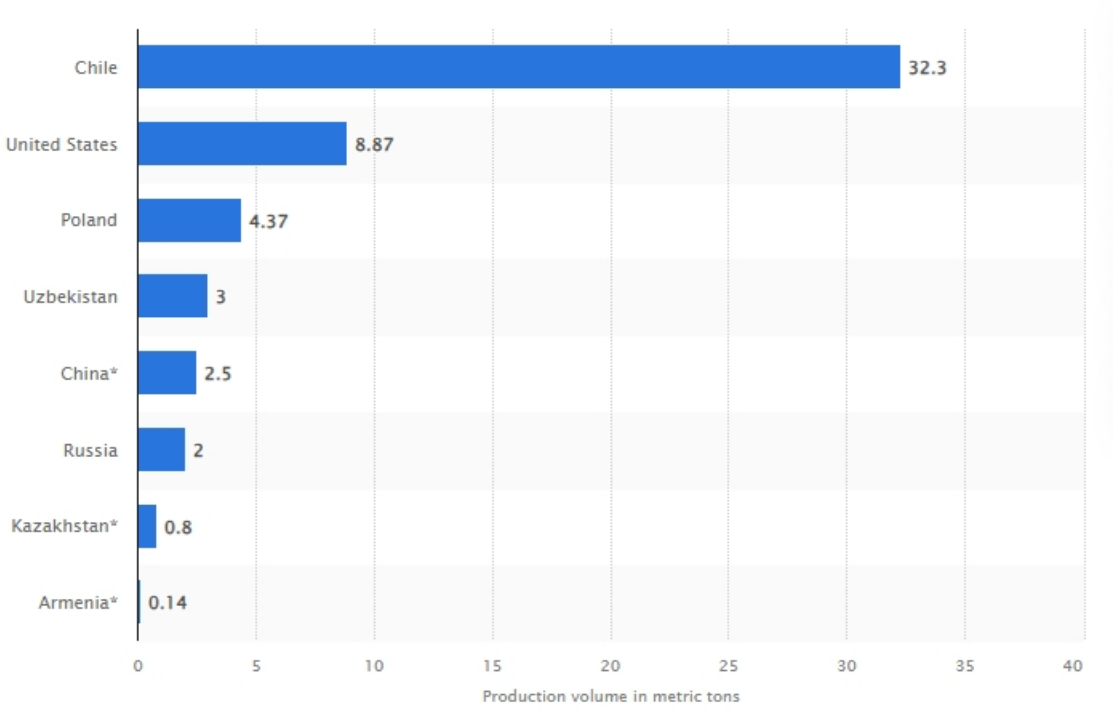

Figure 1: Production by Country (source: securities.io)

0.4 Companies

Some small junior exploration companies claim to have rhenium deposits. NDM Northern Dynasty has a large copper deposit in Alaska, however due to its ecologically sensitive location and local community opposition, it may never be developed [7]. A defunct company, Copper North Mining through a subsidiary Redbed Resources Corp., had control of the Redstone deposit in NWT Canada [3]which according to Natural Resources Canada hosted significant potential rhenium resources. It appears Redbed is still pemitted to conduct exploration [5]and has been the recipient of mining incentive program funds [6]. Fitzroy Minerals (FTZ) has a Chilean Cu-Mo-Au-Re deposit that has shown promising results recently. Multi-metal Development (MLY.V) claims it is advancing the largest unmined Mo deposit in the world on its website and mentioned rhenium [8]. The stock is currently halted pending the outcome of a BC securities commission cease trade order: "*The executive director alleged that Multi-Metal contravened section 168.1(1)(b) of the Securities Act by filing a false or misleading technical report with the Commission, and further contravened sections of National Instruments 43-101 Standards of Disclosure for Mining Projects and 51-102 Continuous Disclosure Obligations.* " [9]

...So in spite of the positive PR spin these companies mount, to date they have been catalysts for investment losses.

References

[1] https://en.wikipedia.org/wiki/Rhenium

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[3] http://www.nafinance.com/zGetCompanyProfile.aspx?tradedSymbol=Col&langCd=En

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[5] https://www.wlwb.ca/registry/mv2019c0029

[6] https://www.iti.gov.nt.ca/sites/iti/files/Mining_Incentive_Program_Recipients_2024-2025.pdf

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[8] https://multimetdev.com/molybdenum/critical-minerals/

[9] https://cdn-ceo-ca.s3.amazonaws.com/1jnbf6j-2024-BCSECCOM-473.pdf