

Historical Review of Unconventional Sources of Uranium in Northern Chile.



Mario Arancibia Nanjarí

Geologist

Chilean Nuclear Energy Commission

Overview

- Unconventional sources in Chile partially known by previous exploration plans (1982)
- Some pre-feasibility studies done at the 1980's with good technical but uneconomically results due to low uranium prices.
- Other projects reached different stages of exploration
- Lack of exploration in the last years

Types of unconventional sources known in Chile

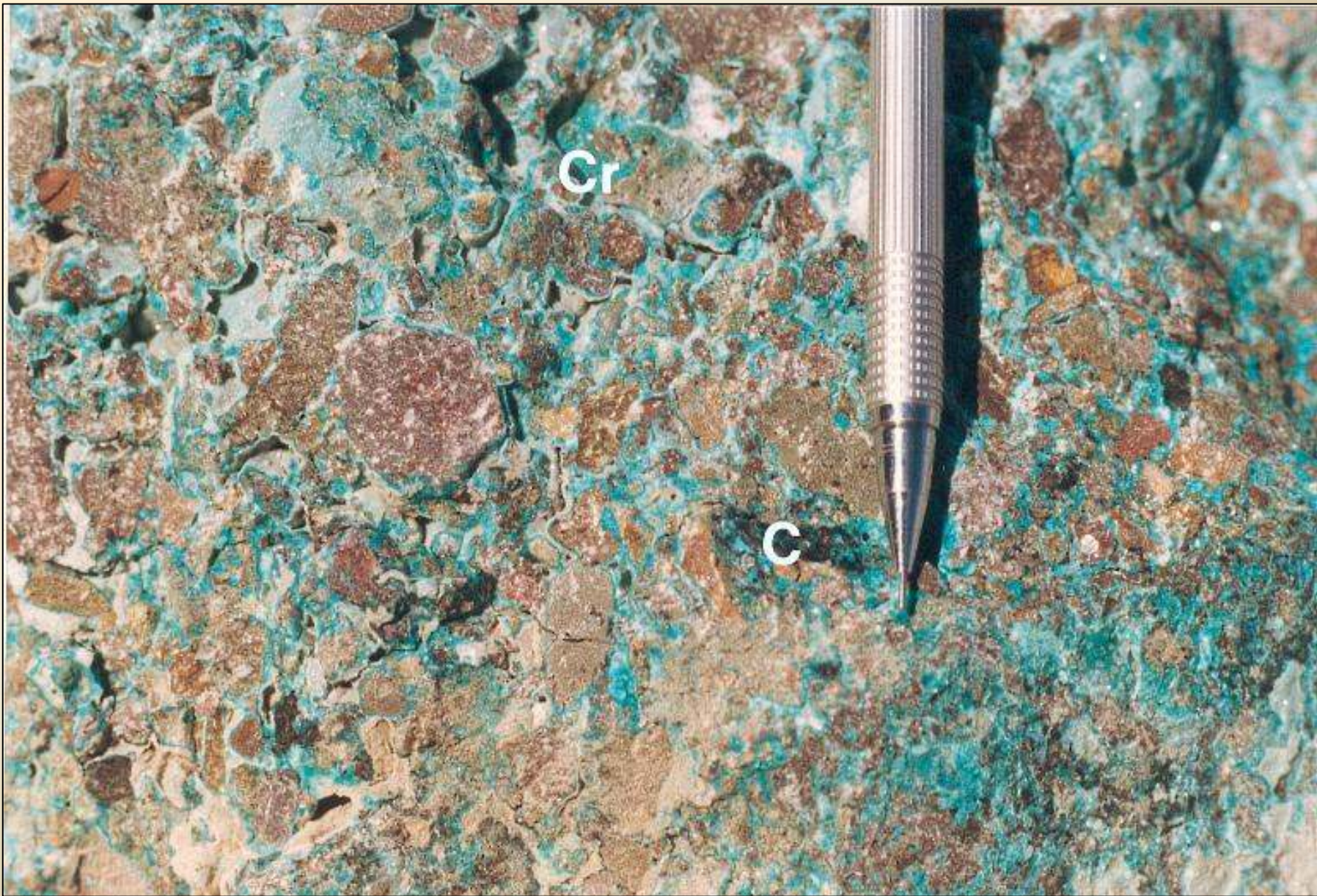
- Copper deposits
 - Porphyry copper
 - Exotic
- Salt flats
- Phosphate rocks
- Others?

Porphyry and exotic copper deposits

- Most of the biggest supergiant and behemotian type of porphyry copper deposits located in Chile
- Uranium recoverable as a by product from leaching circuits
- Very low grades of U in the rock (0.02%?)
- Deposits of big size

Exotic deposits

- Mineralized (Cu) fluids deposited in paleochannels and hosted as matrix in detritical rocks, mainly gravels
- Feasibility studies made by CODELCO and CCHEN to recover of uranium as a by-product of copper in Mina Sur, south of Chuquicamata in 1982



Mineralized gravel from Sagasca deposit.

Phosphate rocks

- 1980 Radiometric survey showed interesting anomalies in the coastal plains near Caldera, III Region.
- Bahia Inglesa Fm. Had an estimate of 1560 ton of U_3O_8 as REA in 1982.
- Actually being exploited for fertilizers by BIFOX
- Other occurrences detected in correlative formations north and south of Bahia Inglesa Fm.



Phosphate rocks from the Bahia Inglesa Formation, with rich fine grained apatite (Mean grade of 17% P_2O_5 and 77 ppm of U_3O_8)

Salt Flats

- Salt flats are widely present at the northeast part of Chile
 - Salar Grande showed an aeroradiometric anomaly and was explored by ESSEX mineral company in 1977 to 1982
 - Extensional tectonics in the miocene created a Pull Apart Basin
 - Source of uranium came from acid volcanic arch in Paleogene.
 - Extremely arid conditions contributed to evaporate the salt brines enriched in U, which allowed the enrichment of uranium near the surface in Neogene

Location Map



Salar Grande area

5Km



Blue halite
sample, taken at
Salar Grande,
north of Chile

Conclusions

- Studies about uranium content and distribution could be a very important by-product on Chilean copper mining industry, as happened with Molybdenum and Rhenium
- Uranium exploration in other areas with similar geological conditions should be made to enhance this as a prospective area for private
- Extent of phosphate rock outcrops is very limited, but studies proved the recoverability of U, economy of this should be reevaluated
- Other type of deposits should be studied, like coal and lignite in southern Chile.

End

Questions?

