Classifying the production of lithium, cesium and tantalum from the Tanco mine, Manitoba, Canada, according to UNFC – A Case Study

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UNFC Case Study: Tanco mine

Why make a case study of the Tanco mine?

- Active operation of critical minerals;
- Multicommodity;
- Very well studied deposit (geology);
- Not a lot of information on the resource estimation;

Demonstrates the challenges of the classification of multiproduct mines.

Example of application of the United Nations Framework Classification (UNFC) for Resources.
The Tanco Mine

Location

Canada

Manitoba

Location of the Tanco mine
- Known maximum lateral dimensions: 1060 m (N–S); 1520 m (E–W); up to 100 m thick (E–W) through its center; ~ 40 m thick on average;
- Pegmatite is subhorizontal; intruded metamorphic rocks: amphibolite and gabbro;

- Age: approximately 2631 ± 12 Ma (Camacho et al., 2012);
- ~ 2627 drill holes (above and underground); ~ 172 km of recovered core;
The Tanco pegmatite
Idealized mine cross-section

Cross-section of the Tanco mine looking southwest (from Tetratech, 2013).
Produced tantalum (Ta) ore (tantalite) since 1967 (off and on); cesium (Cs) ore (pollucite) and lithium (Li) ore (spodumene);
The Tanco pegmatite

Mineralogy

Contact with albite-quartz assemblage; green colour is due to the presence of the green mica.

Tantalum mineralization in an albite-beryl-mica assemblage; scaling bar chisel end is 25.5 cm.
The Tanco pegmatite

Mineralogy

- Lepidolite
- Quartz
- Pollucite zone
- Aplite
- Beryl fringe
The Tanco pegmatite
Mineralogy

Spodumene – quartz intergrowth (SQI) pseudomorph of petalite, which grew toward pollucite

Lower border zone contact; black tourmaline crystals grew inward from the walls of the dike, and fine-grained tourmaline pervasively dots the rock.
The Tanco pegmatite: underground

Scooptram close to one of the spodumene zone pillars illustrating the room and pillar method used at Tanco.

Custom designed aerial lifts ("giraffe").
Specific Gravity of Spodumene = 3.15 gm/cc
Specific Gravity of Petalite = 2.43 gm/cc
Specific Gravity of Quartz = 2.65 gm/cc
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Classification

- Reserve estimates (public record) are a variety of historical formats;
- Considered non-compliant with current Canadian National Instrument (NI43-101) requirements;
- The deposit has a mineable resource in current underground operations (amalgamated value that includes measured, indicated and inferred):
  - 2,324,400 tonnes with a Li₂O grade of 1.859% containing a Li₂O metal quantity of 43,206.78 tonnes;
  - 3,709,570 tonnes with a Ta₂O₅ grade of 0.109% containing a Ta₂O₅ metal quantity of 4,037.52 tonnes;
  - 116,400 tonnes with a Cs₂O grade of 13.83% containing a Cs₂O metal quantity of 16,100 tonnes.
UNFC Case Study: Tanco mine

Classification

- UNFC should be applied to the different commodities separately;
- E-axis (*Environmental-Socio-Economic Viability*): 1.1 for Lithium and Cesium; 3.3 for Tantalum;
- F-axis (*Technical Feasibility*): 1.1 for Lithium and Cesium; 2.3 for Tantalum;
- G-axis (*Degree of Confidence*): G3 for Lithium, Cesium and Tantalum (reserve estimates include measured, indicated and inferred).

<table>
<thead>
<tr>
<th>Classification</th>
<th>Type</th>
<th>Commodity</th>
<th>Quantity (tonnes)</th>
<th>Grade</th>
<th>Metal Content</th>
<th>Sub Class</th>
<th>E</th>
<th>F</th>
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<td>Cs₂O</td>
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<td>116,400</td>
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<tr>
<td>113 Underground</td>
<td>Li₂O</td>
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<td>2,324,400</td>
<td>1.86%</td>
<td>43,206.78</td>
<td>In Production</td>
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<td>Tantalum</td>
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<td>333 Underground</td>
<td>Ta₂O₅</td>
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<td>3,709,570</td>
<td>0.10%</td>
<td>4,037.52</td>
<td>Development Not Viable</td>
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<td>2.3</td>
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</table>
UNFC Case Study: Tanco mine

Conclusion

- Multicommodity production: can produce Lithium or Cesium without producing Tantalum;
- Not throwing the other products away, but it allows for selective mining (also include tailings reprocessing);
- Market drives what mine is producing so the classification changes through time (Tantalum classification example);
- One or two of the commodities are profitable enough, the mine can operate; if only one of the commodities is being produced and is not profitable, the mine might shut down.

<table>
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<tr>
<th>Year</th>
<th>Type</th>
<th>Commodity</th>
<th>Quantity (tonnes)</th>
<th>Grade</th>
<th>Sub Class</th>
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<td>1982</td>
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<td>Tailings</td>
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<td>2010</td>
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<td>0.10%</td>
<td>Development Not Viable</td>
<td>3</td>
<td>2.3</td>
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</tbody>
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Tantalum classification
THE VIEWS EXPRESSED ARE THOSE OF Tania Martins of the Manitoba Geological Survey AND DO NOT NECESSARILY REFLECT THE VIEWS OF THE UNITED NATIONS.

Thank you!

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Date 24 I 4 I 2024, Geneva