Current Situation of Mining Industry, Exploration and Mineral Potentiality in Albania, Focused on Chrome and Nickel

NATIONAL AGENCY OF NATURAL RESOURCES

Tokyo, August 27, 2008
CHROME IN ALBANIA

NATIONAL AGENCY OF NATURAL RESOURCES

Tokyo, August 27, 2008
DATA ABOUT CHROME IN ALBANIA

- Chromium production commenced in 1948
- Produced quantity during 1948–2007: 26.8 million tons
- Production in year 2006: 189,531 tons
- Production in year 2007: 285,000 tons
- Chromium Concentrate in 2006: 2,800 tons
- Chromium Concentrate in 2007: 2,800 tons
- Mining method: mainly, underground
- The reason of production falling: the investment lack
- Chromium ore is connected with eastern belt of ophiolite
- Chromium ore export production 2007: 325,000 tons
BRIEFLY ABOUT GEOLOGY

• The most important level of mineralization is Bulqiza - Batra Qaf-Buall level, which is connected with Harcburgite-Dunite (H-D) facia, close to its floor.

• Second level, in importance of mineralization point of view, is connected with Harcburgite-Dunite (H-D) facia and is Thekna, Tërnova, Shkalla, Vlahna, Vanas, etc. level.

• Third level is that, which is connected with Dunite (D) facia, with big dimensions and is Krasta, Maja Lugut, Qaf-Lame, Livadhi Dashit, Kalimashi, Përroi Batrës, etc. level, where the mineralization is poor, for enrichment.
Exploration geological and mining workings in chromium deposits have verified some morphological forms of ore bodies:

- Wrinkled concordant tubular bodies: Bulqiza-Batra
- Concordant and sub concordant bodies: Lugu Gjatë, Qaf-Buall, Fush-Lopa, Tërnova
- Concordant and sub concordant tubular bodies: Shkalla, Liqeni Sopeve, Pojska, Lugu Qershisë
- Podiphorme stratified-meniscus bodies: Thekna
- Stratified concordant bodies: Krasta
CHROME-BEARING MASSIFS OF EASTERN BELT

1. Ultrabasic Massif of Tropoja
2. Ultrabasic Massif of Kuksi
3. Ultrabasic Massif of Lura
4. Ultrabasic Massif of Bulqiza
5. Ultrabasic Massif of Shebeniku
6. Ultrabasic Massif of Pogradeci
7. Ultrabasic Massif of Krabi
8. Ultrabasic Massif of Gomsiqe
9. Ultrabasic Massif of Skenderbe
10. Ultrabasic Massif of Kutermani
11. Ultrabasic Massif of Shpati
12. Ultrabasic Massif of Guri Zi
13. Ultrabasic Massif of Vallamara
14. Ultrabasic Massif of Devolli
15. Ultrabasic Massif of Voskopoja
16. Ultrabasic Massif of Morava
17. Ultrabasic Massif of Vithkuqi
## Characteristics of Albanian Chromium Ores According to the Cr$_2$O$_3$ Content

<table>
<thead>
<tr>
<th>Chemical components, in%</th>
<th>Classification according to % Cr$_2$O$_3$</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;40÷42</td>
<td>36÷40</td>
<td>30÷36</td>
<td></td>
</tr>
<tr>
<td>SiO$_2$</td>
<td>11.5</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>FeO</td>
<td>11.8</td>
<td>12.5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Al$_2$O$_3$</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>MgO</td>
<td>23.5</td>
<td>23</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>TiO$_2$</td>
<td>0.16</td>
<td>0.16</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>CaO</td>
<td>0.31</td>
<td>0.5</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>MnO</td>
<td>0.11</td>
<td>0.23</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>CoO</td>
<td>0.02</td>
<td>0.015</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>NiO</td>
<td>0.25</td>
<td>0.22</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>P$_2$O$_5$</td>
<td>0.01</td>
<td>0.09</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>V$_2$O$_5$</td>
<td>0.11</td>
<td>0.02</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Loss in Calcination</td>
<td>2.90</td>
<td>3.1</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Ration Cr/Fe</td>
<td>3/1</td>
<td>2.7/1</td>
<td>2.6/1</td>
<td></td>
</tr>
</tbody>
</table>
There are three main regions of Ultrabasic Massifs of chromite in Albania:

1. North-East Region (Ultrabasic Massif of Tropoja and Kukës)
2. Central Region (Ultrabasic Massif of Bulqiza).
3. South-East Region (Ultrabasic Massif of Shebenik-Pogradeci)

Present Geologic Reserves of chromite in these regions are:

- Category B+C₁: 21.8 million tons
- Category C₂: 15.1 million tons
- Total: B+C₁+C₂: 36.9 million tons
There are 148 mining permits in chrome activity, from which:

- Bulqiza region: 88
- Mati region: 15
- Diber region: 1
- Hasi region: 5
- Tropoja region: 26
- Kukesi region: 3
- Pogradec region: 3
- Librazhdi region: 8

Chrome production 2006: 285,000 tons
Chrome export production 2007: 325,000 tons
CHROME EXPLOITATION PERMITS IN EACH DISTRICT

- Bulqize: 8
- Mat: 3
- Diber: 26
- Kukes: 15
- Tropoje: 53
- Librazhd: 8
- Pogradec: 88
CHROMIUM ORE PRODUCTION IN YEARS

Chromium ore production during 1948-2007
ULTRABASIC MASSIF OF HAS TROPOJA

- It is located 100 km in North of Tirana
- Area of massif: 440 km²
- Thickness of ultrabasic rocks: 6÷8 km
- Depth of explored ore bodies: up to 300 m
- Geological reserves, situation:
  - 6.1 million tons x 26.48% Cr₂O₃
- Production in year 2007: 16754 tons with 36-38% Cr₂O₃, 1268 tons with 34% Cr₂O₃ and 22 tons with 40% Cr₂O₃
- Perspective: under 300 m, can be encountered rich chromium bodies
- Perspective deposits: Zogaj, Vlahna, Qaf-Perollaj
- Number of occurrences and explored deposits: 286
- Number of mining permits: 26
Vlahna Mine

- The exploitation commenced in 1986
- The mining way: it is underground
- The opening: it is with horizontal workings from surface up to +650 and it is designed with shaft for depth
- Production in years 1986-1996: 45 000 tons
- Destination: partly for export with content 30% \( \text{Cr}_2\text{O}_3 \) and for enrichment
- The bottom opening level: +650
- The bottom mining level: +700
- The depth geological results: -370 m (profile 16)
- Situation of reserves on 01.01.2006: 2.56 million tons x 29.2% \( \text{Cr}_2\text{O}_3 \)
- The perspective: it is open at depth. It is possible to discover reserves with over 38% \( \text{Cr}_2\text{O}_3 \)
- Mine status: southern part is used from private subjects, while centre and northern parts are unoccupied.
VLAHNA MINE

Cross Section 27

Deep angle: 75°
Average thickness: 2.5 m
Average content: 30% Cr$_2$O$_3$
QAF-PEROLLAJ MINE

- The exploitation commenced in 1989
- The mining way: it is underground
- The opening: it is with horizontal workings from the surface
- Production in years 1989÷2006: 60,000 tons
- Destination: for export as ore of group 30%-34% Cr₂O₃ content
- The bottom opening level: +565 (Gal.5)
- Situation of reserves on 01.01.2006: 433,000 tons x 31.3% Cr₂O₃
- The perspective: it is open at depth and along the extension.
- Mine status: it has been used from private subjects, 2004 year
QAF-PEROLLAJ MINE

VERTICAL SECTION OF QAF PEROLLAJ MINE
• The exploitation commenced in 1980
• The mining way: it is underground
• The opening: it is with horizontal workings from surface
• Production in years 1980–2000: 520,000 tons
• Destination: export for enrichment in chromium dressing plant in Deva, Kosova
• The bottom opening level: +480
• Situation of reserves on 01.01.2006:
  1.238 million tons, me 24÷28% Cr₂O₃
• The perspective: it is opened at depth and in sides.
• Mine status: it is unoccupied, it is closed since year 2000
ZOGAJ MINES

Zogaj 3

Zogaj 1

HORIZONTAL PLAN AND DEVELOPMENT OF ZOGAJ 1-ZOGAJ 3 MINES

Auto. road Kam-Oaf Prush
ULTRABASIC MASSIF OF KUKËS

• It is located 80 km in East-North of Tirana
• Area of massif: 108 km²
• Thickness of ultrabasic rocks: about 5 km
• Deepness of explored ore bodies: up to 300 m
• Geological reserves, situation:
  6.8 million tons x 21.4% Cr₂O₃
• Production in year 2007: 2553 tons with 30% Cr₂O₃ and 400 tons with 36% Cr₂O₃
• Perspective: under 300 m, there can be encountered rich chromium bodies
• Perspective deposits: Kalimashi, Përroi Batrës
• Number of occurrences and explored deposits: 54
• Number of mining permits: 3
In this mine are included:
- Kalimash 1
- Kalimash 2
- Kalimash 3
- Përroi Batrës

The exploitation commenced in 1978

The mining way: it is mainly underground, except a part of Kalimashi 3, is in open shaft.

The opening is with horizontal workings from surface

Destination for enrichment

The main level of transport: +700

The bottom mining level: +600, Kalimashi 2
KALIMASH MINE

• The opening under the level +700: with vertical shaft from underground
• Situation of reserves on 01.01.2006:
  5.1 million tons x 18÷23% Cr₂O₃
  From these:
  - Kalimash 1  = 1.9 million tons
  - Kalimash 2  = 0.4 million tons
  - Kalimash 3  = 1.6 million tons
  - Përroi Batrës = 1.2 million tons
• The perspective: in deepness could meet rich chromium bodies
• Mine status: the mine is closed since 2000 year
KALIMASHI 3 MINE

Deep angle: 25°÷35°
Average thickness: 1.5 m
Average content: 20% Cr₂O₃
KALIMASHI 1 MINE

Deep angle: 20°÷25°
Average thickness: 1.8 m
Average content: 20% Cr₂O₃
MASSIF OF BULQIZA

- It is located 40 km in East-North of Tirana
- Area of massif: 370 km²
- Thickness of ultrabasic rocks: 4÷6 km
- Deepness of explored ore bodies: 1300 m
- Geological reserves, situation: 12 million tons
- Geological reserves, over 38% Cr₂O₃: 7.5 million tons
- Production in year 2007: 145431 tons chromium ore, with 36-40% Cr₂O₃ and 11000 tons concentrates
- Perspective: it is opened in all deposits
- Number of occurrences and explored deposits: 65
- Number of mining permits: 104
MASSIF OF BULQIZA

- Shkalla Mine
- Bulqiza Mine
- Batra Mine
- Krasta Mine
- Thekna Mine
- Ternova Mine
Main layout composition

Shkalla Mine
Qaf Lame Mine
Bulqiza Mine
Fe-Cr Plant Burrel
Luçana Mine
Lugu Qershise Mine
South Batra Mine
Krasta Mine
Maja Lugut Mine
Fushe Lopa Mine
Lugu Gjate
10 Korrikru Mines
Liqeni Sopeve Mines
Ternova Mine
North Thekna Mine
Thekna Mine
BULQIZA MINE

- First signs of chromium mineral in Bulqiza: 1942
- Production from occurrences: 1942–1944
- Production from the mine: commenced in 1948
- The part over H.+820 m level is open with horizontal workings from surface
- The part under H.+820 m level is open with vertical shaft
- The bottom opened level: level XVI (-6 m)
- Situation of reserves on 01.01.2006, over level XVI: 690,000 tons x 46.75% Cr$_2$O$_3$
- Situation of reserves 01.01.2006, under the level XVI: 2,126,800 tons x 44.91% Cr$_2$O$_3$
- The lowest level reached with drills: -440 m
- Thickness of interception: 3.7 m
- The grade from the samples: 39.99% Cr$_2$O$_3$
- Mine status: with concession since the year 2001
BULQIZA MINE

VERTICAL SECTION AND DEVELOPMENT OF BULQIZA MINE

[Diagram showing vertical section and development of Bulqiza Mine]
FIFTH LEVEL DEVELOPMENT OF BULQIZA NORTH MINE, LINKS BETWEEN RAMP AND KLOSI TUNNELS
BULQIZA MINE

Deep angle: 25÷30 up to 70÷75
Average thickness: 2.5÷3 m
Average content: over 45% Cr₂O₃
QAF-BUALL MINE

- It was discovered by drillings during the 1983÷1985 years
- The ore body is situated under the level +420
- Length in extension: 300÷350 m
- Length in falling: 250÷300 m
- Thickness: 1.5÷6 m
- The perspective: is open in extension and falling
- The bottom level of exploration: +100 m
- The ore grade is increased towards deepness: levels +180, +140, +100, have reserves with content over 43.5% Cr$_2$O$_3$
KLOSI TUNNELS

- They are designed capital workings, aiming to serve North Bulqiza Mine and Qaf-Buall Mine:
  - For ore transporting to Klosi Plant
  - For water extraction from +420 m out in surface
- They will connect Vth level (+420m) of Bulqiza Mine with surface
- Designed length: 2x7310 ml
- The level in entrance of edits: 372.16 m
- Tunnel 1 is opened 5435 ml
- Tunnel 2 is opened 5182 ml
- Light section of tunnels: 10.2 m²
- The work was stopped: year 1998
- The distance between 2 tunnels: 20 ml
- The distance from tunnel entrances to H.M. Klosi Plant: 1.2 km
- Status: since 2001 year, it is included in concession agreement
KLOSI TUNNELS

- Light section of tunnels: 10.2 m²
- The work was stopped: year 1998
- The distance between 2 tunnels: 20 ml
- The distance from tunnel entrances to H.M. Klosi Plant: 1.2 km
- Status: since 2001 year, it is included in concession agreement
THE RAMP

- It was designed and opened partly as main opening working of Qaf-Buall Mine
- Entrance level: 665.191 m
- The level in connection with Vth level workings: +431 m
- Designed length: 2150 ml
- Light section: 16 m²
- Incline: 11%
- Opened working: 1842 ml
- Work stopping: 2000 year
- Status: unoccupied
The exploitation commenced in 1967
- The mining way: is underground
- The opening: is with horizontal workings from surface
- Production in years 1968÷2006: 5,610,000 tonx38% Cr₂O₃
- Production in years 1999÷2006: 220,000 tons
- Destination export and enrichment
- Situation of reserves on 01.01.2006: 730,000 tons
The exploitation commenced in 1967
The mining way: is underground
The opening: is with horizontal workings from surface
Destination export and enrichment
Situation of reserves on 01.01.2006: 730.000 tons
The perspective: it is open in deepness and in the sides
The bottom mining level: +1100 m
The top mining level: +1560 m
Mine status: since 1999 year it was given to 12 private subjects that are working independently in different edits
BATRA MINE VIEW
BATRA MINE
Central ore body

Eastern parts

Western parts

Deep angle: 10°÷30°
up to: 70°÷80°

Average thickness: 3 m

Average content: 38% Cr₂O₃
THEKNA MINE

- The exploitation commenced in 1959
- The mining way: is underground
- The opening is with horizontal workings from surface
- Destination: export
- The top mining level: edit 31 (+1670)
- The bottom mining level: Descenderia No.7 (+1160)
- The bottom opening level: edit 28 (+1100)
- Situation of reserves on 01.01.2006: 652,300 tons
- The perspective: it is open in deepness and in the sides
- Mine status: since 1999 year it was given to 17 private subjects that are working independently in different edits.
THEKNA MINE
KRASTA MINE

- The exploitation commenced in 1971
- The mining way: is mainly underground, small parts in open sky.
- The opening: is with horizontal workings from surface
- Destination: mainly enrichment
- Situation of reserves on 01.01.2006: 2 million tons
- Mine status: after 1999 year some galleries were given for use to 4 private companies, the others were closed
LUGU GJATË – 10 KORRIKU MINES

• The exploitation has begun in year 1968 up to 1971 and after 14 years of breaking it has re-began again in the year 1985
• The mining way: is underground
• The opening: is with horizontal workings from surface
• Destination: export
• The bottom mining level: +1600 m
• Situation of reserves on 01.01.2006:
  69.800 tons, with content over 42% Cr₂O₃
• The perspective: it is open in deepness
• Mine status: since 1999 year it was given to 5 private subjects that are working independently in the edits of this mine
LUGU GJATË – 10 KORRIKU MINES
FUSH-LOPA MINE

- The exploitation commenced in the 1989
- The mining way: is underground and in open pit
- The opening: is with horizontal workings from surface
- Destination: export
- The bottom mining level: +1684 m
- The bottom opening level: +1600 m
- Situation of reserves on 01.01.2006:
  79,900 tons, with content over 44% Cr$_2$O$_3$
- The perspective: it is open in deepness and extension
- Mine status: since 1999 year it was given to 3 private subjects that are working independently in the edits of this mine
FUSH-LOPA MINE

Perspective zone for exploration
MASSIF OF SHEBENIK - POGRADEC

- It is located 65 km in East-South of Tirana
- Area of massif: 270 km²
- Thickness of ultrabasic rocks: 4 km
- Deepness of explored ore bodies: 300 m
- Geological reserves, situation:
  1.2 million tons, over 38% Cr₂O₃
- Production in year 2007: 5355 tons, with 36% Cr₂O₃
- Perspective: It is opened. It is the massif where it is invested less in investigation-exploration
- Perspective zones: Katjel-Pojska; Bushtrica-Përroi Govatës.
- Number of occurrences and explored deposits: 115
- Number of mining permits: 11
KATJEL MINE

- Chromium production has begun in year 1982
- Mining method: underground
- The opening over the level +650: with horizontal workings from surface
- The opening under the level +650: with descenderic working and vertical pit
- Production during concession period 2000÷2006: 72,000 tons
- Average grade of produced mineral: 36% Cr$_2$O$_3$
- Destination: export
- Reserves situation on 01.01.2006: 145,916 tons x 45.27% Cr$_2$O$_3$
- The bottom mining level: +470 m
- Status: since year 2000, it is included in concession agreement
KATJEL MINE

VERTICAL SECTION OF KATJELI MINE
Exploitation bottom level

Deep angle: 70°
Average thickness: 1.5÷2 m
Average content: 45% Cr₂O₃
POJSKA MINE

- Chromium production has begun in year 1988
- Ore body has exited in surface
- The part over +920 m was exploited in pit out
- The part under +920 m was exploited underground
- The opening under the level +920 m: with horizontal workings from surface
- Average grade of produced mineral: 40÷42% Cr$_2$O$_3$
- Destination: export
- Reserves situation: 16000 tons, with 23÷28% Cr$_2$O$_3$
- Status: it is included in concession agreement
POJSKA MINE

VERTICAL SECTION POJSKA MINE

Level +906

Level +870

Level +835

Level +800
Deep angle: 70°÷75°
Average thickness: 3.5÷4 m
Average content: 43% Cr$_2$O$_3$
The workings of opening are continuing

It is concretized as object after geological workings, in the year 1986

The opening is realized with horizontal workings from surface

The bottom designed working is in the level +1388

Length in accordance with the project is: 2000 ml

Realized workings: 400 ml

Geological reserves situation:

31.100 tons x 41.06% Cr₂O₃

Opened perspective towards North (profile XV) and in depth

Status: in usage from a private company
PËRROI GOVATËS DEPOSIT
THANK YOU FOR YOUR ATTENTION

http://www.akbn.gov.al
Tel: 00355 4 2246195
Fax: 00355 4 2257382