

RODRIGO ALEJANDRO MUNIZAGA ZAMBRANO

SENIOR GEOLOGIST / MSc ECONOMIC GEOLOGY

UNIVERSIDAD CATÓLICA DEL NORTE, ANTOFAGASTA, CHILE

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□ **SUMMARY**

Geologist of the Universidad Católica del Norte. MSc in Economic Geology (UCN graduated). Professional with 22 years of experience in metallic mining, specifically in generative exploration, advanced exploration, greenfield projects, brownfield projects and production geology, in deposits of Cu (Porphyry Cu / IOCG), Fe (IOA) and Au-Ag polymetallics (Au-Ag-Pb-Zn).

□ **SKILLS AND COMPETENCIES**

- Leadership • Risk Management in Processes • High Safety and Environmental Standards • Community Relations • Strategic Vision • Business Vision • Teamwork • Resilience • Change Management • Adaptive Process • Innovation • Continuous Improvement • Communication • Proactivity

WORK HISTORY

➤ **SENIOR CONSULTING GEOLOGIST / SENIOR ADVISER** **(August 2023-Current)**

Currently advising on different stages of exploration and in the geological-mining field, from generative stages to start-up, IOA-IOCG type projects and Cu deposits to various medium-sized mining companies.

- Definition of Targets / Negotiation with Third Parties / Planning of Exploration Budgets / Definition of Greenfield Type Exploration Activities / Production Geology / Design and Rump Up of Mining Plants / Planning of Production Stages (Pre-Stripping, Operations, Budgets and Investments) / Marketing of Final Product.

➤ **OPB MINING / CHILEAN JUNIOR COMPANY**

GEOLOGY AND MINING SUPERINTENDENT / SALITROSA MINE Fe-Cu (IOA-IOCG) **(March 2022-July 2023)**

In charge of exploration, planning and execution of production geology, site administration, plant quality control and final product dispatch, at Mina Salitrosa. In general, in charge of technically leading the progress of the Project.

- Personal Administration / Explorations / Geological Model / QA-QC / Contract Administrator / Technical Studies / Mine Stability / Geophysics / Geochemistry

SENIOR GEOLOGY-MINING CONSULTANT / OPB MINING**(August 2021-February 2022)**

Evaluation of greenfield type mining projects (Fe-Cu): Salitrosa Project, Las Marianas Tailings, Acopios Bellavista, Cerro Imán Mine, and Javiera Project.

- Greenfield Exploration / Project Ranking / Targeting / Negotiation with Third Parties / Business Model / Chemical Analysis / Metallurgical Testing / Geophysics

➤ **PACIFIC MINING COMPANY (CMP)**

GEOLOGY SUPERINTENDENT / PLANNING AND DEVELOPMENT MANAGEMENT**(January 2019 - May 2021)**

Responsible for leading Advanced Exploration Projects in their different stages (IOA-IOCG) and Short-Medium-Long Term Production Geology of Cerro Negro Norte Mine, Los Colorados Mine, Pleito Mine and El Romeral Mines.

- Brownfield Evaluation of Projects / Community Relations / Environmental Studies / Administration of Drilling Campaigns / Construction of Geological-Geometallurgical Models / Estimation of Geological Resources / Operator of External Contracts / Annual Budget / Five-year Budgets / Due Diligence Projects / Machine Learning / Management System Process Risk Management (GRP) / Resource Development Planning (RDP) / LOM (Life of Mine) Planning

HEAD OF PRODUCTION GEOLOGY / LOS COLORADOS MINE**(December 2008 - December 2019)**

Responsible for leading Production Geology in the short-medium term, ensuring quality standards such as position, cubic size, tonnage and grades of mineralized bodies. Likewise, in charge of planning and executing geomechanical activities with the purpose of ensuring the stability of slopes in the pit.

- Short-Medium Term Geological Planning / Lithological-Textural Geological Models / Infill Drilling Campaigns / Geomechanical Drilling Campaign / Geomechanical Control and Monitoring / Monitoring Radars / External Contract Operator / Database Administration

➤ **HERENCIA RESOURCES PLC / AUSTRALIAN JUNIOR COMPANY**

(November 2005-November 2008)**EXPLORATION GEOLOGIST**

PAGUANTA PROJECT: Polymetallic (Au-Ag-Pb-Zn) and Porphyry Cu-Mo deposits located in the highlands of the I Region of Tarapacá.

- Exploration of Medium-Low Sulfidization Epithermal Deposit / Definition of Targets of Interest / Surface Geological Mapping with Emphasis on Lithology, Alteration, Mineralization and Structures / Geological Modeling / Planning and Mapping of Exploration Drilling Campaigns

LA SERENA PROJECTS: Review and evaluation of mining concessions in the northern foothills of the IV Region of Coquimbo. Mapping and sampling focused on the exploration of Cu-Au and Cu-Mo porphyry type deposits.

➤ **GUÍÑEZ INGENIERÍA LTDA / MINERA ESCONDIDA LTDA**

(March 2003-November 2005)

DRILLING GEOLOGIST

Mapping and control of geological drilling in Mina Escondida (Cu-Mo Porphyry) for the generation of technical data that feed the geological, geotechnical and block models. Definition of ceiling and base of leached zones, oxide zones, mixed zones, secondary enrichment zones and hypogenic zones.

- Drillhole Mapping / Stockpile Mapping / Marine Mapping / Geological Model / Database

➤ **THESIS DEVELOPMENT**

(March 2002-December 2002)

Development of a memory project in the Potrerillos District, Mina Vieja, III Region of Atacama. Carrying out a district geological mapping, analysis of the deformation of the country rock and structural modeling of the Potrerillos Mine Copper Porphyry site. Guide Professor Dr. Hans Niemeyer R.

❑ **TRAININGS/COURSES**

- **Leadership Academy Certification.** Leadership-Adaptive Processes. CAP / Adolfo Ibáñez University (2018).
- **14th SGA Biennial Meeting.** Quebec City, Canada (2017).
- **EF International Certification, Tarrytown, New York, USA.** Advanced English course (2015).
- **Vulcan Courses (2013-2014)**
- **Course “Geostatistics Applied to Mining” (2012)**
- **Master in Economic Geology with a Major in Mining Explorations.** Universidad Católica del Norte (Graduate / 2011-2012).
- **MineSight Courses. (2009-2011)**
- **International Seminar “Slope Stability” (2009)**
- **Mapinfo Course (2006)**
- **Geophysical Prospecting Course (UCN 2005)**
- **Industrial Rocks and Minerals Course (UCN 2005)**
- **Satellite Remote Sensing Course and Erdas Imagine Software Application (UCN 2005)**
- **Partial Extraction Workshop.** Normative mineralogy and its applications in Minera Escondida Ltda (2005).
- **GVMapper course (2004)**

❑ **LANGUAJES**

- Native Spanish
- Intermediate English

❑ **PUBLICATIONS**

- **Mineralium Deposita (2019).**

The role of the subducting slab and melt crystallization in the formation of magnetite-(apatite) systems, Coastal Cordillera of Chile.

Torno, F.; Hanchar, J.; Munizaga R.; Velasco, F.; Galindo, C.

- **Mineral Resources To Discover. 14th SGA Biennial Meeting. Quebec City, Canadá (2017).**
The roots and tops of magnetite-Apatite mineralization: evolving magmatic-hydrothermal systems.
Tornos, F.; Hanchar, J.; Velasco, F.; Munizaga, R.; Levresse, G.
- **Geochimica et Cosmochimica Acta 177: 94-104 (2016).**
Fe-O stable isotope pairs elucidate a high-temperature origin of Chilean iron oxide-apatite deposits.
Bilenker, L.; Simon, A.C.; Reich, M.; Lundstrom, C.; Bindeman, L.; Munizaga R.
- **Journal of Economic Geology 111: 743-761 (2016).**
Trace element signature of pyrite from the Los Colorados iron oxide-apatite (IOA) deposit, Chile: A missing link between Andean IOA and IOCG systems?.
Reich, M.; Simon, A.C.; Detitius, A.; Barra, F.; Chrysosoulis, S.; Lagas, G.; Tardani, D.; Knipping, J.L.; Bilenker, L.; Sanchez-Alfaro, P.; Roberts, M.P.; Munizaga, R.
- **Geochimica et Cosmochimica Acta 171: 15-38 (2015).**
Trace elements in magnetite from massive iron oxide-apatite deposits indicate a combined formation by igneous and magmatic-hydrothermal processes.
Knipping, J.L.; Bilenker, L.; Simon, A.C.; Reich, M.; Barra, F.; Detitius, A.; Walle, M.; Heinrich, C.A.; Holtz, F.; Munizaga, R.
- **Geology 43: 591-594 (2015)**
Giant Kiruna-Type deposits form by efficient flotation of magmatic magnetite suspensions.
Knipping, J.L.; Bilenker, L.; Simon, A.C.; Reich, M.; Barra, F.; Detitius, A.; Lundstrom, C.; Bindeman, I.; Munizaga, R.
- **XIV Congreso Geológico Chileno (2015).**
Antecedentes Geológicos del Yacimiento de Magnetita-Apatito Los Colorados, Provincia del Huasco, Tercera Región de Atacama Chile. Rodrigo Munizaga Z & Mario Lagos B.
- **Journal of South American Earth Sciences. (V26-2008), (pp. 261-270).**
Structural control of the emplacement of the Potrerillos Porphyry Copper, Central Andes of Chile.
Hans Niemeyer & Rodrigo Munizaga.

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