



# **Volcanogenic Massive Sulfide Ore Deposit**

**Mark Donald Hannington, Charles  
Tucker Barrie**



## Volcanogenic Massive Sulfide Ore Deposit

Encyclopedia of Marine Geosciences Jan Harff, Martin Meschede, Sven Petersen, Jörn Thiede, 2021-01-14 Globally growing demand of energy and mineral resources reliable future projection of climate processes and the protection of coasts to mitigate the threats of disasters and hazards require a comprehensive understanding of the structure ongoing processes and genesis of the marine geosphere Beyond the classical research fields in marine geology in current time more general concepts have been evolved integrating marine geophysics hydrography marine biology climatology and ecology As an umbrella the term marine geosciences has been broadly accepted for this new complex field of research and the solutions of practical tasks in the marine realm The Encyclopedia of Marine Geosciences comprises the current knowledge in marine geosciences whereby not only basic but also applied and technical sciences are covered Through this concept a broad scale of users in the field of marine sciences and techniques is addressed from students and scholars in academia to engineers and decision makers in industry and politics

Volcanic-associated Massive Sulfide Deposits C. Tucker Barrie, Mark D. Hannington, 1999

Applied Structural Geology of Ore-forming Hydrothermal Systems Julie V. Rowland, David A. Rhys, 2020

**Volcanogenic massive sulfide deposit density ,**

**Volcanic-associated Massive Sulfide Deposits: Processes and Examples in Modern and Ancient Settings** C.T. Barrie, M.D. Hannington, 1999



Volcanogenic Massive Sulfide Occurrence Model Wayne C. Shanks, Roland Thurston, 2012 Volcanogenic massive sulfide VMS deposits also known as volcanic hosted massive sulfide volcanic associated massive sulfide or seafloor massive sulfide deposits are important sources of copper zinc lead gold and silver Cu Zn Pb Au and Ag These deposits form at or near the seafloor where circulating hydrothermal fluids driven by magmatic heat are quenched through mixing with bottom waters or porewaters in near seafloor lithologies Massive sulfide lenses vary widely in shape and size and may be podlike or sheetlike They are generally stratiform and may occur as multiple lenses Volcanogenic massive sulfide deposits range in size from small pods of less than a ton which are commonly scattered through prospective terrains to supergiant accumulations like Rio Tinto Spain 1.5 Bt billion metric tons Kholodrina Russia 300 Mt million metric tons Windy Craggy Canada 300 Mt Brunswick No 12 Canada 230 Mt and Ducktown United States 163 Mt Galley and others 2007 Volcanogenic massive sulfide deposits range in age from 3.55 Ga billion years to zero age deposits that are actively forming in extensional settings on the seafloor especially mid ocean ridges island arcs and back arc spreading basins Shanks 2001 Hannington and others 2005 The widespread recognition of modern seafloor VMS deposits and associated hydrothermal vent fluids and vent fauna has been one of the most astonishing discoveries in the last 50 years and seafloor exploration and scientific studies have contributed much to our understanding of ore forming processes and the tectonic framework for VMS deposits in the marine environment Massive ore in VMS deposits consists of 40 percent sulfides usually pyrite pyrrhotite chalcopyrite sphalerite and galena non sulfide gangue typically consists of quartz barite anhydrite iron Fe oxides chlorite sericite talc and their metamorphosed equivalents Ore composition may be Pb Zn Cu Zn or Pb Cu Zn dominated and some deposits are zoned vertically and laterally Many deposits have stringer or feeder zones beneath the massive zone that consist of crosscutting veins and veinlets of sulfides in a matrix of pervasively altered host rock and gangue Alteration zonation in the host rocks surrounding the deposits are usually well developed and include advanced argillic kaolinite alunite argillic illite sericite sericitic sericite quartz chloritic chlorite quartz and propylitic carbonate epidote chlorite types Bonnet and Corriveau 2007 An unusual feature of VMS deposits is the common association of stratiform exhalative deposits precipitated from hydrothermal fluids emanating into bottom waters These deposits may extend well beyond the margins of massive sulfide and are typically composed of silica iron and manganese oxides carbonates sulfates sulfides and tourmaline

**Understanding Mineral Deposits** Kula Misra, 2012-12-06 Mineral deposits have supplied useful or valuable material for human consumption long before they became objects of scientific curiosity or commercial exploitation In fact the earliest human interest in rocks was probably because of the easily accessible useful e.g. red pigment in the form of earthy hematite or valuable e.g. native gold and gemstones materials they contained at places In modern times the study of mineral deposits has evolved into an applied science employing detailed field observations sophisticated laboratory techniques for additional information and computer modeling to build complex hypotheses Understanding concepts that would someday help geologists to find new mineral deposits or exploit the known ones more efficiently have always been and will continue to be at the core of any course on mineral deposits but it is a fascinating subject in its own right even for students who do not intend to be professional economic geologists I believe that a course on mineral deposits should be designed as a capstone course that illustrates a comprehensive application of concepts from many other disciplines in geology mineralogy stratigraphy and sedimentation structure and tectonics petrology geochemistry paleontology geomorphology etc This book is intended as a text for such an introductory course in economic geology primarily for senior undergraduate and graduate students in colleges and universities It should also serve as a useful information resource for professional economic geologists

Volcanogenic Massive Sulfide Deposits of Latin America Ross Lawrence Sherlock, Amelia Logan, Geological Association of Canada. Mineral Deposits Division, 2000

**The Giant Kidd Creek Volcanogenic Massive Sulfide Deposit, Western Abitibi Subprovince, Canada** Mark Donald  
Hannington, Charles Tucker Barrie, 1999

**Ore Deposit Studies and Exploration Models**, 1998

**Sulfide Mineralogy** Paul H. Ribbe, 1974

**Mineral Deposits of Canada** Wayne David Goodfellow, 2007

**Mineral Resources of Turkey** Franco Pirajno, Taner Ünlü, Cahit Dönmez, M. Bahadır Şahin, 2019-01-21 This book furnishes detailed information about Turkey's existing mineral resources besides providing concepts and ideas which may help the search for potential mineral resources in the future. It is a first book in the English language international literature on mineral resources of Turkey and it is aimed at economic geologists, mining engineers, and mining investors as well as graduate and undergraduate students. This work focuses mainly on a range of mineral systems and related geological features throughout Turkey. Taking into account the lack of international literature on these resources, a considerable portion of the book explains the geological context of the region and the settings in which the mineral resources occur. The genetic characteristics of these mineral resources are emphasized, and important information is also presented on their economic aspects. All chapter contributions are prepared by researchers and professional geologists.

Scientific Investigations Report Sharon E. Kroening, 2004

**Volcanic Environments and Massive Sulfide Deposits** June Pongratz, J. Bruce Gemmell, 2000

**Base Metal Sulfide Deposits in Sedimentary and Volcanic Environments** Günther H. Friedrich, Peter M. Herzig, 2013-03-09 The geology and metallogeny of base metal sulfide deposits in Europe, Africa, and Australia was the topic of the DMG/GDMB/SAG Joint Meeting held in Aachen, FRG, September 16-19, 1985. Divided into two parts, the presented papers cover the description and interpretation of sediment-hosted as well as volcanic sediment-hosted and volcanic-hosted copper-zinc-lead-gold-silver deposits. The present compilation is an overview of current research activities and results on copper-zinc-lead deposits in classical mining districts, considering geological, lithological, geochemical, and tectonic parameters of ore formation. Even in periods of depressed metal prices, base metal sulfide deposits still remain one of the most attractive mineral exploration targets. This extensive review provides valuable information to researchers and explorationists.

**Petrogenesis of Metamorphic Rocks** Kurt Bucher, Martin Frey, 2013-04-17 Metamorphic rocks are one of the three classes of rocks. Seen on a global scale they constitute the dominant material of the Earth. The understanding of the petrogenesis and significance of metamorphic rocks is therefore a fundamental topic. There are of course many different possible ways to lecture on this theme. This book addresses rock metamorphism from a relatively pragmatic view point. It has been written for the senior undergraduate or graduate student who needs practical knowledge of how to interpret various groups of minerals found in metamorphic rocks. The book is also of interest for the non specialist and non petrologist professional who is interested in learning more about the geological messages that metamorphic mineral assemblages are sending as well as pressure and temperature conditions of formation. The book is organized into two parts. The first part introduces the different types of metamorphism, defines some names, terms and graphs used to describe metamorphic rocks and discusses principal aspects of metamorphic processes. Part I introduces the causes of metamorphism on various scales in time and space and some principles of chemical reactions in rocks that accompany metamorphism but without treating these principles in detail and presenting the thermodynamic basis for quantitative analysis of reactions and their equilibria in metamorphism. Part I also presents concepts of metamorphic grade or intensity of metamorphism such as the metamorphic facies concept.

**The Geology of Ore Deposits** John M. Guilbert, Charles F. Park, Jr., 2007-02-09 Modern civilizations dependence upon an increasing volume and diversity of minerals makes the search for new ore deposits ever more difficult. Now available from Waveland Press Guilbert and Park's text presents ideas, principles and data fundamental for beginning economic geologists to understand the genesis and localization of ore deposits and of the minerals associated with them. The authors comprehensively describe the physical and chemical characteristics of ore deposits and correlate them with environments and conditions of deposition since ore deposits are best interpreted as extensions of the environments responsible for their enclosing rocks. Examples and illustrations emphasize structural, chemical and temporal controls and encourage the three dimensional thinking used by productive explorationists as they face unsolved problems. This upper level undergraduate text is fully illustrated and meticulously indexed. Its reliable, authoritative coverage assumes an upper level command of chemistry and physics as well as mineralogy, petrology and structural geology. Outstanding features: develops and combines the abilities of the explorationist and of the researcher of ore forming processes; structures the geologic descriptions into groupings recognized by researchers and explorers alike; builds confidence, revitalizes curiosity and encourages expanded thinking; emphasizes that the days of easy discovery of outcropping ores are not over; includes revised, expanded and updated descriptions of districts.

Mineralogy, Mineral Chemistry, and Genesis of Precious Metal-bearing Volcanogenic Massive Sulfide Deposits in the Newfoundland Appalachians, Canada Stefanie Michaela Brueckner, 2016 The Ming deposit Newfoundland Appalachians is a metamorphosed upper greenschist to lower amphibolite facies Cambro Ordovician bimodal mafic volcanogenic massive sulfide VMS deposit that consists of several spatially associated elongated orebodies composed of stratabound semimassive to massive sulfides and or discordant sulfide stringers in a rhyodacitic footwall Copper is the main commodity however the deposit contains precious metal bearing zones with elevated Au grades In this study field observations microscopy and micro analytical tools including electron microprobe laser ablation inductively coupled plasma mass spectrometry and secondary ion mass spectrometry were used to constrain the relative timing of precious metal emplacement the physico chemical conditions of hydrothermal fluid precipitation and the sources of sulfur precious metals semi metals and metals The ore mineral assemblage is complex and indicates an intermediate sulfidation state Pyrite and chalcopyrite are the dominant ore minerals with minor sphalerite and pyrrhotite and trace galena arsenopyrite and cubanite Additional trace phases include tellurides NiSb phases sulfosalts electrum AgHg Au alloys and oxides Silver phases and precious metals occur predominantly in semi massive and massive sulfides as free grains and as grains spatially associated with arsenopyrite and or sulfosalts Precious metal phases occurring between recrystallized pyrite and within cataclastic pyrite are rare Hence the complex ore assemblage and textures strongly suggest syngenetic precious metal emplacement whereas metamorphism and deformation only internally and locally remobilized precious metal phases The ore assemblage formed from reduced acidic hydrothermal fluids over a range of temperatures 350 to below 260°C The abundance of telluride and Ag bearing tetrahedrite however varies strongly between the different orebodies indicating variable Te<sub>2</sub> Se<sub>2</sub> mBi and mSb within the hydrothermal fluids The variations in the concentrations of semi metals and metals As Bi Hg Sb Se Te as well as Au and Ag were due to variations in temperature but also to a likely contribution of magmatic fluids into the VMS hydrothermal system from presumably different geothermal reservoirs Sulfur isotope studies indicate at least two sulfur sources sulfur from thermochemically reduced seawater sulfate and igneous sulfur The source of igneous sulfur is the igneous footwall direct magmatic fluid volatiles or both Upper greenschist to lower amphibolite metamorphic conditions and deformation had no significant effect on the sulfur isotope composition of the sulfides at the Ming deposit

Structural Control of Mineral Deposits Alain Chauvet, 2019-04-16 Structural Control remains a crucial point that frequently lacks in any scientific and or economic analysis of ore deposits whatever their type and class The case of lode deposits is exemplary although also other deposits like breccia pipe stockwerk massive sulphides skarn etc can surprisingly be concerned Several concepts like the gold bearing shear zone have not proven valid during the last few decades in terms of our understanding of gold deposit and have been totally abandoned Additionally the relationships between magmatism regional tectonic context and mineralization remain uncertain and have been debated in several recent publications This demonstrates that this issue is still relevant and its solution may help in the distinction between intrusion related and orogenic deposits In this Special Issue we particularly invite any case study of mineral deposits in which it has been demonstrated that structural geology may have a significant role in the establishment of the deposit model of formation and or on exploration and exploitation programs Examples in which the structural model diverges from those described in the classical literature are particularly welcomed including studies in which relationships with magmatism can be suspected and or demonstrated Indeed all cases that illustrate concepts that differ from the classic ones and from theoretical models may represent significant contributions to this volume

The book delves into Volcanogenic Massive Sulfide Ore Deposit. Volcanogenic Massive Sulfide Ore Deposit is a crucial topic that must be grasped by everyone, ranging from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Volcanogenic Massive Sulfide Ore Deposit, encompassing both the fundamentals and more intricate discussions.

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    - Chapter 4: Volcanogenic Massive Sulfide Ore Deposit in Specific Contexts
    - Chapter 5: Conclusion
  2. In chapter 1, this book will provide an overview of Volcanogenic Massive Sulfide Ore Deposit. This chapter will explore what Volcanogenic Massive Sulfide Ore Deposit is, why Volcanogenic Massive Sulfide Ore Deposit is vital, and how to effectively learn about Volcanogenic Massive Sulfide Ore Deposit.
  3. In chapter 2, this book will delve into the foundational concepts of Volcanogenic Massive Sulfide Ore Deposit. The second chapter will elucidate the essential principles that must be understood to grasp Volcanogenic Massive Sulfide Ore Deposit in its entirety.
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  6. In chapter 5, the author will draw a conclusion about Volcanogenic Massive Sulfide Ore Deposit. The final chapter will summarize the key points that have been discussed throughout the book.
- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Volcanogenic Massive Sulfide Ore Deposit.

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