

ESF-LESC Exploratory Workshop

Non Sulfide Zn-Pb Ores: genetic models and exploration - the European deposits

Scientific Report



Iglesias (Sardinia, Italy) 21-23 April 2005

Convenors:

*Maria Boni - Dipartimento di Geofisica & Vulcanologia
Università "Federico II" Napoli, Italy*

*H. Albert Gilg - Lehrstuhl für Ingenieurgeologie
Technische Universität München, Germany*

1. Executive summary

Approximately 30 economic geologists and students have been attending between the 21st and the 23rd of April 2005, the Exploratory Workshop on Non Sulfide Zn-Pb deposits sponsored by European Science Foundation (ESF-LESC), which took place in the small town of Iglesias, South West Sardinia (Italy). This old mining locality was chosen because South West Sardinia was a lively exploitation center for the “Calamines” (supergene Zn-Pb carbonate and silicate ores) during part of the 19th and the 20th century. Many remnants of the exploitation as well as of the old dumps, tailings and processing plants, are still widespread throughout the district.

Non Sulfide Zn-Pb minerals in Europe and the Middle East, were the historical basis for the development of the zinc mining and smelting industry. With the recent development of solvent-extraction and electro-winning processes, there has been a sudden revival in commercial as well as scientific interest for this style of mineralization throughout the world. This has been the main reason to organize the Workshop whose title was: “Non Sulfide Zn-Pb Ores: genetic models and exploration - the European deposits”. Convenors have been Maria Boni, of the Dipartimento of Geofisica & Vulcanologia, Università “Federico II” of Napoli, Italy and H. Albert Gilg of the Lehrstuhl für Ingenieurgeologie of the Technische Universität München, Germany. Both convenors are active since a few years in this relatively new field of research, together with a limited, but growing number of interested people both from the academy and industry world alike.

ESF representative was Paedar McArdle, (Irish Geological Survey), who introduced in detail the European Science Foundation and the different funding instruments that it provides for supporting different sorts of initiatives in European scientific research.

The main objective of the ESF Exploratory Workshop was to verify the State of the Art and scientific progress on the subject of Non Sulfide Zn-Pb ores in Europe and elsewhere in the world, two years after the publication of the 98/4 2003 issue of Economic Geology on this subject. More specifically, the main goals of the Workshop were:

- The exchange of information on the status of the scientific researches on Non Sulfide Zn-Pb deposits,
- The geological, mineralogical and geochemical characterization of the Supergene and Hypogene ore types,
- A discussion on the different techniques that can be applied to the study and exploration of Non Sulfides,
- The geological significance of Non Sulfides concentration throughout Europe and a possible application of these concepts to exploration,
- The environmental impact of the exploitation of Non Sulfide ores,
- To investigate the possibility of producing a joint European Programme.

These goals have been pursued throughout several talks, organized for specific themes, which covered two days of the Exploratory Workshop. A lot of discussion

was carried out all along the meeting, but also during the fieldtrip in order to prioritize scientific exchange among the participants. This was indeed one of the most valuable characteristics of the Workshop: the possibility of having long and intense discussions on the topics covered, a fact that is neither usual nor allowed in normal scientific conferences, and that was greatly appreciated by all participants.

At the end of the Workshop, a global discussion took place, in which participants analyzed the possibility of applying for a ESF Programme. This discussion was enlightened by the technical information provided by Dr. Paedar McArdle. The unanimous consensus was that the groups represented at the meeting are ready to engage in such a programme, that will certainly allow to coordinate efforts efficiently in order to make progresses in better understanding Non Sulfide Zn-Pb ore deposits and other related themes (metallurgical processing, environment etc.).

Maria Boni and H. Albert Gilg were elected unanimously as the “Connection Officers” and responsible for exploring the possibility of preparing a multidisciplinary Programme.

2. Scientific content of the event

Most of the themes anticipated were well represented by several talks during the Workshop. There were two days of talks (morning and afternoon sessions) and a one-day fieldtrip. The length of the talks ranged up to 30 minutes, and each session was followed by discussion time. The scientific talks, were organized in four thematic blocks:

1. Introductory talks: characterization and processing of Non Sulfide Zn-Pb ores,
2. Techniques of investigation (geological, mineralogical and geochemical),
3. Regional case studies (from both European and extra-European realm),
4. Environmental impact of the exploitation of Non Sulfides.

For the first block (Introductory talks: characterization and processing), a strong accent has been set on the keynote presented by M.Hitzman, who is one of the “authorities” in the field of Non Sulfide deposits. He reported on the main characteristics of several Non Sulfide deposits in the world and on the corresponding exploration methods. A.Woollett (ZincOx) described the Non Sulfide deposits from the point of view of the mining companies, pointing to different processing methods and to their economic and environmental sustainability. The relationships between Non Sulfide deposits and European paleoclimate have been reviewed by M.Boni & D.Large.

The second block (Techniques of investigation) has been covered by several participants, who spoke about the techniques used in their respective ore districts. One of the two conveners (H. A.Gilg) devoted himself to illustrate the results obtained by the fairly new technique of applying stable isotope (O-C) geochemistry to the genetic question of non sulfide metallic minerals. J. Schneider introduced the possibility of using a relatively old dating technique (Rb-Sr isotopic geochemistry) to

uncover the age of the Zn-silicate mineral Willemite. J. Reichert reported on numerical modelling techniques applied to Non Sulfide deposits.

Regional case studies have been illustrated by most of the participants. The quoted European examples were: Italy (M.Boni), Poland (T.Smakowski, B. Strzelska-Smakowska and H.Kucha), Greece (N.Skarpelis), Ireland (G.Balassone & G.Stanley), Belgium (V.Coppola), Spain & Morocco (E.Cardellach). Extra-European examples have been proposed by E.Belogub (Non Sulfides in the Urals), F. Melcher and J.Schneider (Non Sulfides in Northern Namibia), M.Campodonic (Jemen) and J.F. Larivière (Canada). Also in the section of extra-European regional studies, it was peculiar to have 3 presentation on the Angouran deposit (Iran). In the talks, given by F.Daliran, A.Annels and H.A.Gilg, were presented different and controversial aspects of this giant orebody.

The fourth block (Environmental impact) consisted of only two, very interesting, presentations, limited to SW Sardinia and given by P.Lattanzi and G.De Giudici.

3. Assessment of the results, contribution to the future direction of the field, outcome

As a first and more important result, all the participants underlined the uniqueness of the ESF Workshop with respect to more traditional meetings as it allowed long, deep and rich discussions on specific as well as on more general topics. Throughout the Workshop, the lively scientific debate (I have mentioned the 3 talks only on the Angouran deposit!!) was performed generally in a friendly atmosphere among the participants

The European ores, being very interesting but mostly uneconomic, were exhaustively discussed mainly from the genetic, paleoclimatic and environmental point of view. Among the European deposits, it raised a certain interest the genetic interpretation of the Belgium Non Sulfide ores, containing the Zn-silicate Willemite (V.Coppola), mainly exploited in the “La Calamine” deposit. However, the European districts that were discussed also from the economic point of view, were the areas of the Polish Calamines in Upper Silesia (B. Smakowska), that have not been completely exploited so far and, at a minor scale, the Irish district (G.Stanley).

Outside Europa, great potential has been recognized to Morocco, Iran and, surprisingly, to Canada. The talk of J.Lariviere on the Non Sulfide Zn ores (Franklin-Sterling type) in the Canadian Grenville district, could represent a milestone in the field of knowledge of this kind of deposits.

Another subject that was increasingly discussed among the participants, were the more environmental-friendly qualities of Non Sulfide Zn ores compared with those of Sulfide ore deposits. On the same subject, it was also very interesting the attempted evaluation (made by P.Lattanzi) of the environmental impact of the many dumps containing low-grade non sulfide minerals in the Iglesias region in Sardinia, coupled with the dispersion effect of the raising water table in the oxidation zone after the recent closure of the mines. Also on the environmental front, a subject which raised a strong interest, was the potential of some Non Sulfide Zn minerals (as f.i.

hydrozincite) in acting as traps for heavy metals when performing geochemical remediation (talk of G.De Giudici).

As a conclusion, the general opinion among the participants was that for most of them the days of the Workshop have been not only extremely fruitful for enhancing their scientific and practical knowledge of Non Sulfides, but that also a series of possibilities for present and future collaboration on several themes have been opened on both European and extra-European level.

A collection of papers on "Current Research on Nonsulfide Zn-Pb Deposits", mainly derived from the contributions to the ESF Workshop, has been planned for publication on a special issue of the Journal "Ore Geology Reviews". The manuscripts should be sent before August, 1st 2005 to the co-editor H. Albert Gilg, Lehrstuhl für Ingenieurgeologie, Technische Universität München, Arcisstr. 21 80333 München (Germany), e-mail: agilg@tum.de.

4. Final Programme

20 April – Arrival of the participants throughout the day. Transport from Cagliari airport to Iglesias (Hotel Artu)

Iglesias – Archivio Storico

1° Day – 21 April Morning

8.30 M. Boni & H.A. Gilg - Introduction to the Workshop

8.45 Welcome to Iglesias from a local political authority

9.00 Start of the presentations

M.W. Hitzman - Overview of Non Sulfide Zinc Deposits.

A. Woollett - The Processing of Non Sulfide Zinc Deposits.

M. Boni & D. Large - Paleoweathering in Europe and Non Sulfide Zn-Ores: a neglected link.

10.30 – 11.00 Coffee Break

H.A. Gilg - Stable isotope geochemistry of Non Sulfide Zn-Pb deposits

J. Reichert & G. Borg - Numerical modelling and geochemical aspects of the metallogenesis and preservation of carbonate-hosted Non Sulphide zinc deposits.

N. Skarpelis – Non Sulfide zinc ores in Lavrion, Greece.

M. Boni - The “Calamine” in Sardinia: short history and illustration of the fieldtrip.

13.00 – 14.00 Lunch

1° Day – 21 April Afternoon

F. Melcher, T. Oberthür, U.K. Vetter & A. Günzel - The Otavi Mountain Land, Namibia: Examples of Non Sulfide and Sulfide Base Metal Mineralization

J. Schneider, M. Boni, C. Laukamp & T. Bechstädt - Age and origin of Non Sulfide Zn-Pb(-V) ores in the Otavi Mountainland (Namibia) constrained from radiogenic isotopes (Pb, Sr).

15.30 – 16.00 Coffee Break

M. Campodonic - Geological and Assay modelling of the Jabali Zinc Oxide deposit, Yemen.

E. Belogub, K. Novoselov & S. Sadykov - Supergene zonality of the South Urals VHMS and related deposits.

P. Lattanzi - The environmental impact of non-sulfide Zn ores: a case history from Sardinia.

Discussion

18.00 - End of the presentations

20.00 - Social Dinner in Portoscuso

2° Day – 22 April Morning 8.00 Start of the Fieldtrip

During the fieldtrip have been visited: the Monteponi-Cungiaus open pit, the abandoned Nebida mine and the Buggerru-Malfidano outcrops.

A small guidebook has been delivered to the participants. However, a complete description of the local geology, mostly focused on Lower Paleozoic sedimentary rocks, was performed at each Stop.

3° Day – 23 April Morning

8.30 Start of the presentations

T. Smakowski & B. Strzelska-Smakowska - The calamine ores from the Silesia-Cracow ore province (Poland).

H. Kucha - Oxysulfides, smithsonite-siderite and Fe-free smithsonite as indicators of conditions of formation of primary and supergene Non Sulfide Zn-Pb deposits, Upper Silesia, Poland.

G. Balassone, M. Rossi, M. Boni, G. Stanley & P. McDermott - Supergene nonsulfide Zn-Pb ores at Silvermines and Galmoy (Ireland).

J.-F. Larivière & M. Gauthier - Non-sulphide Hypogene Zinc Mineralization in the Mesoproterozoic Grenville Supergroup marbles of the Bryson-Renfrew region (Qc and Ont), Canadian Shield.

10.30 – 11.00 Coffee Break

A.E. Annels - New ideas concerning the genesis of the Angouran Zn-Pb deposit, NW Iran.

F. Daliran & G. Borg - The Non Sulfide Zinc Ore Deposit of Angouran, NW Iran.

H.A Gilg, M. Boni, G. Balassone, C.R. Allen & F. Moore - Genesis of the Angouran Zn-Pb deposit, NW Iran.

E. Cardellach, M. Bouabdellah, M. Corbella, F. Grandia, À. Canals & S. Adil - Zn-oxide deposits in carbonates of Mesozoic age in eastern Iberian peninsula and Eastern Morocco.

13.00 – 14.00 Lunch

3^o Day – 23 April Afternoon

G. De Giudici - F. Podda & P. Lattanzi - An unusual occurrence of bioprecipitated hydrozincite - a possible trap for heavy metals.

V. Coppola G. Balassone, M. Boni, L. Dejonghe & H.A. Gilg - The “Calamine” ore deposits in Belgium.

Discussion

15.30 – 16.00 Coffee Break

General Discussion. End of the Workshop: 18.30

5. Full List of Participants (including full title, address, tel, fax, e-mail)

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6. Statistical information on participants (age bracket, countries of origin, etc)

Disciplines represented:

Geology
Mineralogy
Geochemistry
Isotope Geochemistry
Economic Geology
Environmental Geology
Ore Resources Management

Countries represented:

Italy, Germany, Ireland, United Kingdom, Spain. Greece, Poland, Russia, Morocco, USA, Canada

Age bracket:

20-30	30-40	40-50	50-60 and over
4	6	8	10



Workshop attendees gather in the Quintino Sella square (Iglesias)

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