

GEOLOGY AND GEOCHEMISTRY OF HETAI GOLD FIELD, SOUTHERN CHINA

Yongzhang ZHOU Ph.D
Institute of Geochemistry
Guangzhou Branch
Chinese Academy of Sciences, P.R. China



华南河台金矿田地质地球化学

周永章著

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PREFACE

The Hetai gold field is the biggest one of the same type discovered in southern China. It has attracted intensive attention of geologists and geochemists since its discovery in 1982, due to its economic and theoretical significance. The gold field, however, has hardly been unveiled in certain respects, and some important problems still remain to be solved despite of the numerous previous exploration and studies. This volume by Dr. Yongzhang ZHOU is the up-to-date comprehensive and systematic description and discussion of the Hetai gold field, laying emphases on his own researches. He succeeded in giving new ideas to some of the unanswered geological and geochemical puzzles of Hetai, and arrived at several important conclusions, which deepen the understanding of the gold field.

In this volume, a whole chapter is devoted to the Gusui bedded chert formation, an integral part of the Sinian (Precambrian) gold source strata, with detailed petrographic and petrochemical (including trace elements) studies. On the basis of these studies, the author concluded that the referred chert formation is of hydrothermal sedimentary origin, and proposed that the hydrothermal activities of a fossil geothermal system may have taken part in the preliminary enrichment of gold during the Sinian period. So far, the nature of the Hetai's chert has scarcely been tackled in geological literature. It should be added that the evidence cited by the author on the hydrothermal genesis of chert is quite convincing.

Another important contribution in the volume is Dr. Zhou's mathematical treatment on the redistribution of trace elements in source rocks. According to the proposed embedded sink mosaic model, the migration pattern of impurity trace elements in a thermal field is a fractal structure. There are two general tendencies of trace element migration. One is from the solid cells toward various weaknesses (sinks) of a geological domain, and the other is from a high temperature field toward lower temperature ones.

Detailed fluid inclusion studies give the author the idea to classify the fluid inclusions of the Hetai deposits into three compositional types. The low-salinity H_2O-CO_2 type represents the primary ore-forming hydrothermal solution, which unmixed into a moderate saline aqueous phase, as well as a non-saline CO_2 -dominated phase. Based on his investigations, the author proposed possible sources and an entrapment mechanism for the ore-forming hydrothermal fluids.

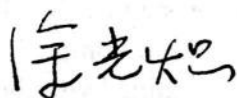
While the description of the geological setting of the Hetai district was taken mainly from the previous investigators, the author did much research on the petrology and trace element geochemistry of the metamorphic rocks. The index minerals of the Hetai schist are

predominantly staurolite, sillimanite and almandine garnet, without kyanite and andalusite. This indicates a metamorphic temperature range from about 550° to 670°C and pressure range from 230 to 600 MPa. The protolith is mainly pelitic or semi-pelitic rocks, intercalated with bedded cherts.

The Hetai gold deposits occur in highly altered and deformed rocks. Practically all geologists working in this area agree that the ductile shear zones and the associated hydrothermal alteration played a fundamental role in the formation of the deposits. Dr. Zhou's achievement in this respect lies in his mass balance estimation using conserved element method. The results demonstrate that silica, precious metals and most thiophile elements were regularly introduced with the advance of alteration, and the mass addition reached its maximum in the ore bodies, with an average mass factor of 1 : 0.84.

Finally, the author established a sound metallogenetic mechanism of the Hetai gold field based on the polygenetic point of view. Sedimentation, regional metamorphism, granitic magmatism, deformation and hydrothermal activities all have their own share in building up the gold field. His mechanism is favored by various geological and geochemical approaches accomplished by him.

Besides its academic significance, presenting in English is one of the distinguishing features of this work, which makes it particularly valuable. As many economic geologists have noticed, China is one of the major contributors to the 1980s' increased stream of gold in the world, but the geological setting and theoretical studies of the gold deposits occurring in China are poorly known outside the country because most published literature is in Chinese, unreadable to most foreigners. Complete and systematic presentation in English is much needed to assist foreigners to obtain a knowledge of individual typical gold deposits of China. I wish that the publication of this work by the young author is a successful attempt in this respect.



Guangzhi TU
Director of Geosciences Division,
Chinese Academy of Sciences

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