Research Advances

New Re-Os Dating of Auriferous Pyrite from the Suolugou Large Gold Deposit in Muli County, West Sichuan Province

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Objective

The Suolugou gold deposit in Muli County of Sichuan Province is located in the southern section of the Ganzi-Litang suture zone (Fig.1a), which is the largest gold deposit discovered in this suture zone in recent years. At present, the exploration of the Suolugou gold deposit is still in progress, and the amount of resource is increasing. The discovery of this deposit is a major breakthrough of gold deposit prospecting in the Ganzi-Litang suture zone, and is also a key breakthrough in the history of gold exploration in Sichuan Province (Liu et al., 2015). Till now, the scale of this deposit has amounted to be a super-large one, with a unique deposit type. The gold ore types are quite complicated, mainly including altered ultramafic rock type, altered basalt type, altered slate type, altered granite porphyry and altered lamprophyre type, etc. The main gold-bearing minerals are pyrite and arsenopyrite, inclusion form gold is the major present form in the pyrites and arsenopyrite, while the fracture form gold is little in the pyrite and arsenopyrite, and thus the gold and the pyrite were formed nearly during the same metallogenic epoch. Therefore, Re-Os isotopic age of the auriferous pyrite may represent the main forming age of gold ores.

Methods

This study collects four samples that are auriferous pyrite-bearing altered basalt type. They are gray-colored, with massive to disseminated structure, and subhedral to euhedral granular and crushed granular textures. Samples were handled by broken, water washing, magnetic selection, alcohol and heavy liquid separation, and finally the auriferous pyrites were hand picked under a binocular microscope. Each sample weighs about 5 g.

Re-Os dating was performed at the Re-Os Laboratory in the National Research Center of Geoanalysis (NRCG), Chinese Academy of Geological Sciences (CAGS), Beijing. The Operating procedures is that the pyrite samples were decomposed in carius tubes, Os was separated by distillation, Re was extracted by acetone and further repurified by cation exchange column, Re and Os compositions and their isotopic ratios

Fig. 1. (a) Simplified tectonic map of the south Sanjiang area; (b) Geological sketch map of the Suolugou gold deposit; (c) Geological map of the Suoluogou gold deposit (after Nie et al., 2015).

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were determined by using a high-resolution inductively coupled plasma mass spectrometry (HR-ICPMS). The principle and details of the analytical methods were presented in references (Du et al., 1994).

Results

Concentrations of Re and Os, and $^{187}$Re/$^{188}$Os and $^{187}$Os/$^{188}$Os isotopic ratios from the Suoluogou gold deposit, corrected for total blanks, are list in Appendix 1. There is 1.02% uncertainty in the decay constant $1.666 \times 10^{-11}$ a$^{-1}$ for Re. The analytical data were processed by using ISOPLOT software, and the obtained Re-Os isochron is presented in Figure 2. Four pyrite samples from the Suoluogou ore body yield a four-point isochron with an age of 238±52 Ma (2σ), an initial $^{187}$Os/$^{188}$Os ratio of 0.62±0.30, and a mean square of weighted deviation (MSWD) of 94, degree of confidence of 95%. Standard sample (JCBY) and blank were used for quality control of analysis in the whole procedure. Contrasting measured values with the recommended values in Appendix 1, the dating is reliable and accurate.

Conclusions

Re-Os isotope analysis of the altered basalt type gold ore from the Suoluogou gold deposit shown that its mineralization age is 238±52 Ma, suggesting that Ganzi-Litang suture zone existed at least an important or-forming event during Indosinian epoch. Genesis of the Suoluogou gold deposit is closely related to the Ganzi-Litang ophiolite melange belt, the time difference between intrusion of magmas and gold mineralization is about 50 Ma.

Acknowledgements

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References


Appendix 1 Re-Os isotope data of auriferous pyrite from Suoluogou gold deposit

<table>
<thead>
<tr>
<th>Sample</th>
<th>Weight (g)</th>
<th>Re (ng/g)</th>
<th>Commonly Os (ng/g)</th>
<th>$^{187}$Os (ng/g)</th>
<th>$^{187}$Re/$^{188}$Os</th>
<th>$^{187}$Os/$^{188}$Os</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLG02-2</td>
<td>0.7013</td>
<td>0.2878</td>
<td>0.0014</td>
<td>0.0131</td>
<td>0.00007</td>
<td>0.00169</td>
</tr>
<tr>
<td>SLG02-3</td>
<td>0.7009</td>
<td>0.1221</td>
<td>0.001</td>
<td>0.00316</td>
<td>0.00003</td>
<td>0.00055</td>
</tr>
<tr>
<td>SLG02-4</td>
<td>0.7001</td>
<td>0.2288</td>
<td>0.002</td>
<td>0.00181</td>
<td>0.00001</td>
<td>0.00711</td>
</tr>
<tr>
<td>SLG02-5</td>
<td>0.7001</td>
<td>0.2834</td>
<td>0.0009</td>
<td>0.00529</td>
<td>0.00003</td>
<td>0.0012</td>
</tr>
<tr>
<td>JCBY</td>
<td>0.200</td>
<td>38.30</td>
<td>0.12</td>
<td>16.27*</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Recommended 38.61 0.54 16.23* 0.17

* total content of Os.