Pockmark activity inferred from pore water geochemistry in shallow sediments of the pockmark field in southwestern Xisha Uplift, northwestern South China Sea

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Pockmarks are widespread on the seabed off southwestern Xisha Uplift, northwestern South China Sea. Some of them are enormous that are rarely observed worldwide, but their activities are poorly known up to now. We collected three gravity-piston cores from this pockmark field, one (C9) from outside but in close proximity to a giant pockmark and the other two (C14 and C19) from inside of two giant pockmarks. The sulfate concentration-depth profiles of C9 and C19 pore water are dominantly in response to organoclastic sulfate reduction (OSR), while the sulfate concentration of C14 pore water exhibits three zones of different concentration gradients resulting from various contribution of OSR and anaerobic oxidation of methane (AOM). The depth-profiles of sulfate $\delta^{34}S$ values of C9 and C14 pore water are in accordance with their sulfate concentration-depth profiles. The relatively low sulfur isotope fractionation in C14 pore water suggests a higher microbial sulfate reduction rate as a possible consequence of AOM than that in C9 pore water. The depth of sulfate-methane interface (SMI) and methane diffusive flux of C14 are estimated to be ~14.3mbsf and ~0.0144 $mol \cdot m^{-2} \cdot yr^{-1}$, respectively, based on the sulfate concentration gradient below 3.7mbsf. Pore water Mg/Ca and Sr/Ca weight ratios imply that high Mg-calcite precipitated in C14. $\delta^{13}C_{DIC}$ values of C9 and C19 pore water are inferred to derive from a binary mixing between $\delta^{13}C$ of organic matter and $\delta^{13}C_{DIC}$ of bottom water, while DIC of bottom water, organic matter, methane, and ^{13}C-enriched DIC from below SMI possibly all contribute to the DIC pool below 0.66 mbsf in C14. The integrated analysis of pore water geochemistry suggests that the pockmark where C19 was collected may be inactive while the pockmark where C14 was obtained may be presently in sluggish activity with methane-bearing fluid weakly seeping from subsurface sediments.

Acknowledgements: This study was supported by NSFC (91228206), CAS (KZCX2-YW-GJ03) and GIGCAS 135 project Y234021001.

Study of geogas nano-particles of metal deposit in Inner Mongorlia plateau, China

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Geochemistry and nano-scale science were adopt in exploration for deep and concealed mineral deposits. The nano- particles in the ascending flow from the concealed ore-bodies are closely to the deposit, and full of the ore-forming information of the type of the deposit. Also modern testing technology can provide a high sensitivity and high resolution method to observe and measure the geogas nano-particles. In our present studies, the static methods of geogas prospecting are used to capture the geogas nano-particles overlying the concealed metal deposit, that are three different types of vegetation form, climate and soil environment in Inner Mongolia plateau, China. The three concealed metal deposits are Dongshengmiao polymetallic pyrite deposit, where is located in Gobi in Hetao Plain of the Yellow River Basin, might be hydrothermal mineralization, Kaxiutata iron deposit is located on the edge of Badanjilin desert, and Bairendaba Ag polymetallic deposit is located in grassland, might be an epithermal silver deposit or a silver orogenic deposit, or of both. The samples are measured by using the TEM technique. The results showed that, the geogas nano- particles may be used as a indicators for prospecting the deep concealed ore-bodies, the characteristics and concentrations of the geogas particles is closely related to the type of the ore-bodies and bedrock, not the type of vegetation form, climate or soil environment. It is suggested that geogas prospecting is feasible and applicable to prospect many different types of metal deposit, even other minerals resources.

The research of this dissertation is supported by the National Natural Science Foundation of China (Grant No. 41030425).

DOI:10.1180/minmag.2013.077.5.12