Geochemistry of Molybdenum Element in Co-rich Crusts from the Magellan Seamounts and Tracing of Paleoceanographic Environment

Guoqing Youa, Jiahua Panb,, Wenhong Sunb and Shuqin Liub

a Institute of Geology, Chinese Academy of Geological Sciences
b Institute of Mineral Resources, Chinese Academy of Geological Sciences
Beijing, China

ABSTRACT

In order to explore the geochemical characteristics of Mo element in Cobalt-rich crusts and their relationship with paleoceanographic environment variation, 56 crust samples and a thick crust from 7 seamounts in the Magellan Seamounts (MST) have been approached in detail. Studies show that the average Mo content of crusts in the area is 444ppm; Mo exhibits a positive correlation with Mn, Ni and Ba with a correlation coefficient of 0.83, 0.79 and 0.52, respectively; a negative correlation with Si, Al and Fe with a correlation coefficient of -0.86, -0.74 and -0.64, respectively. Factor analysis shows that Mo in the MST Cobalt-rich crusts has a close relation with hydrogenous sedimentation and a definite relation with biogeochemical process, but no relation with detritus and Fe phase. Based on the Co chronometer dating, we carry out the research on the relation between Mo content variation and paleoclimate, paleoceanographic phosphogenic events, paleoceanographic redox environment during the growth process of a thick crust. The preliminary results reveal that Mo content would decrease with the climate getting cold; paleoceanographic phosphogenic events cause the loss of Mo content; the change of paleoceanographic redox environment exerts no influence on the variation of Mo content, and Mo dominant species of the incorporation into Cobalt-rich crusts would be relatively simple.

KEY WORDS: Magellan Seamounts, Co-rich crusts, Geochemistry of Mo element, Paleoceanographic environment tracing

INTRODUCTION

Mo is concentrated about hundreds of fold in hydrogenetic Cobalt-rich crusts (hereafter referred Fe-Mn crusts) from oceanic seamounts relative to crustal abundance (1.1ppm) (Takematsu et al., 1985) and up to 1000-fold in hydrothermal Mn crusts (Rogers et al., 2001) and in hydrothermal sulfide Chimneys (Marchig et al., 1997). It also has high Mo abundance in ancient black shale, Cambrian Mg-rich sedimentary exhalation deposits and modern sapropels. Mo abundance will change with the variation of geological environments such as dissolved Mo concentration and PH in solution as well as temperature etc.

Fe-Mn crusts have been attracted and extensively studied by many scientists in types; mineralogy; growth age; element geochemistry; enrichment characteristics and mechanism; resource evaluation etc. (Halbach et al., 1989; Li Y-H, 1991; Koschinsky et al.,1996; Pan et al., 1999; Wen et al., 1997; Usui et al., 1997, 2010; Yamazaki et al., 2000). It has been proved that Fe-Mn crusts is of hydrogenetic origin and most of ore-forming elements such as Co, Cu, Ni, Mn, Fe, Zn, Mo, Pb, REE etc. in Fe-Mn crusts are mainly from seawater. However, little is concerned about the relationship between Mo content variation and the evolution of paleoceanographic environment in earlier studies. If the variation of Mo content in Fe-Mn crusts can be as a proxy or an indicator of paleoceanographic environment change?

It was discovered that Mo exhibited a positive and a negative correlation with Mo and Fe with a correlation coefficient of 0.603...