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Stable isotope study of metacarbonate rocks from western Mongolia: Implications for fluid-rock interaction processes in the Central Asian Orogenic Belt

Mineralization in tectonically active orogenic belts is basically controlled by the movement and activity of fluids. Central Asian Orogenic Belt (CAOB) is a fertile region for mineralization because it consists of several subduction and accretion related metamorphic and magmatic complexes formed between 1000 Ma and 250 Ma, where fluid-rock interaction processes are expected. Metacarbonate rocks provide important windows for understanding the fluid-rock history, because they possess a distinct geochemical and isotopic signature that can vary during various post depositional events. These rock units are important not only in understanding the mineralization processes in the CAOB, but also can give important clues in understanding the tectonic evolution and formation of Asian continent. During the Japan-Mongolia Joint Geological Research we have surveyed several mineralized and non-mineralized metacarbonate rock units from the western and northwestern regions of Mongolia. We present here preliminary data on the carbon and oxygen stable isotopic composition as well as strontium isotope and trace element characteristics of metacarbonate rocks from the several localities in the CAOB.

Metacarbonate rocks occur as relatively thin layers intercalated with pelitic and psammitic gneisses, which can be broadly grouped into two categories based on carbon and oxygen isotopic composition. (1) Metacarbonate rocks that preserve pre-metamorphic stable isotope signatures, and (2) those affected by fluid–rock interaction processes during metamorphism and mineralization events. The former represents potential samples that can be used to infer the timing and environment of deposition of carbonate rocks. The second group of metacarbonate rocks shows clear evidence for fluid-rock interaction processes that created large-scale coupled lowering of carbon and oxygen isotope. These samples also show strontium isotopic variations and trace element patterns, when compared with their unaltered counterparts. The results indicate that the fluid-infiltration, possibly related to magmatic events were responsible for the skarn-type mineralization. In our presentation, we compare and contrast the geochemical characteristics in mineralized and non-mineralized layers of metacarbonate rocks from selected localities in western Mongolia.

Key words: Central Asian Orogenic Belt, Mongolia, metacarbonate rocks, fluid-rock interaction, carbon and oxygen isotopic composition,
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