^{57}Fe Mössbauer study on iron redox state in serpentinized periotite from Darbut ophiolite, western Junggar, NW China

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Serpentinized peridotite is one of the most important components in the ophiolite suite from Darbut, which mainly composed of serpentine, carbonates, magnetite, and talc. Recent studies mentioned the serpentinization of some specific petrologic systems as one of potential mechanism for hydrogen and even abiogenic methane generation along with the petrologic and mineralogical alteration. In order to gain a better understanding of the process of serpentinization, six samples with various degrees of serpentinization were collected and analysed for major elements composition and iron speciation using X-ray fluorescence (XRF) and Mössbauer spectroscopy, respectively. The analytical results indicated some depletion of MgO and CaO along with the increase of serpentinization degree, and also the contents of LOI. At the same time, the ratio of $Fe^{3+}/\Sigma Fe$ was also raised based on Mössbauer spectroscopy measurement. In addition, total amount of iron (tot-Fe) and relative content of ferric iron (Fe^{3+}) were closely related to the formation of magnetite and serpentine in the serpentinized peridotite, being positively increased with the elevation of serpentinization degrees. These minerals and geochemical variations could be potentially significant for a better evaluation of H_2 production during serpentinization and also the behaviour of iron in the subduction zone. All these geochemical parameters indicated that redox change and/or redox conditions were promptly important in the serpentinization of periotite rocks.

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