

Research on the phase composition , expansion property and heavy metals absorption capacity of vermiculite from Yuli Xinjiang Province

L.J. WANG, L.B. LIAO* AND X.X. HUO

School of Material Sciences and Technology, China University of Geosciences, Beijing 100083, China
(*correspondence: lbliao@cugb.edu.cn)

Vermiculite is a kind of natural, non-toxic clay, which was formed from mica weathering or alteration. The Qeganbulak vermiculite ore in Yuli, Xinjiang province is one of the largest vermiculite deposits discovered in China, which is about 90% of the vermiculite reserves in China. Because of its layer ions exchangeability, vermiculites have strong cation exchange capacity, which can be used to remove heavy metals in wastewater.

Under the investigation of X-ray diffraction(XRD), thermogravimetric–differential thermal analysis(TG-DTA), infrared spectroscopy(IR), and chemical analysis etc., vermiculite from Yuli Xinjiang was approved to a mixture of vermiculite, mica, calcite and two kinds of vermiculite-mica mixed-layer minerals Hy-a (vermiculite/mica mole ratio of 6:4), Hy-b (vermiculite/mica ratio of 4:6). Phlogopite was identified as the major type of mica in mica layer in mixed-layer minerals. A small amount of biotite cannot be expelled. Vermiculite are Mg type vermiculite and Na type vermiculite.

Results show that expansion capacity of vermiculite majorly comes from mixing layer minerals(Hy-a, Hy-b), in which Hy-a affect its expansion ability most. The expansion ratio of vermiculite increases with the increase of temperature when the temperature is less than 700 °C, after then it's becoming stable. The expansion ratio of vermiculite reduces with the increase of particle size. The expansion ratio of vermiculite is the highest when its particle size ranges from 1 to 2 mm. When particles are bigger than 2mm, its expansion ratio decreases with the increase of particle size.

Before reaching the absorption/desorption balance of vermiculite towards heavy metal ions like Cd,Cu,Cr etc., the absorption capacity is positive to absorption time, however, after reaching this balance, absorption time won't increase absorption capacity obviously . In addition, the absorption capacity of vermiculite towards heavy metals increases with the increase of concentration of heavy metals. The vermiculite's absorption capacity towards heavy metals can also be phenomenally affected by pH, normally, higher pH can cause higher absorption capacity.

Petrogenesis of Late Permian picritic porphyries associated with Pingchuan iron ores, Emeishan Large Igneous Province, southwest China

MENGWANG¹ AND ZHAO-CHONG ZHANG¹

¹ State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Beijing, 100083, China (houtong08@gmail.com)

The Pingchuan iron oxide deposit is spatially and temporally associated with the Late Permian picritic porphyries in the Emeishan Large Igneous Province, southwest China. The estimated ore reserve for the Pingchuan deposit is 40Mt at ~60 wt.% Fe. The iron ore bodies are intimately associated with the intrusive masses of picritic porphyry, occurring mainly along the contact zone between the picritic porphyries and the sedimentary country rocks, i.e. limestone. The most important ore types are massive and brecciated ores which together make up 90 vol. % of the deposit. The massive type generally occurs as dykes and large veins consisting predominantly of magnetite with minor calcite and apatite. The picritic porphyries are characterized by a marked range of SiO₂ (37.12-47.39 wt. %) and MgO (19.22-29.08 wt. %), but show a minor variation in Na₂O+K₂O (0.12-1.58 wt. %) and TiO₂ (0.64-1.44 wt. %). The total concentration of rare earth elements (REE) is relatively low (21-83 ppm), and show moderate enrichment in light rare earth element (LREE; [La/Yb]_N=3.01-3.63). The primitive-mantle-normalized patterns of the rocks are comparable to those of ocean island basalt, plausibly indicating a plume source. Petrographic observation suggests the Pingchuan picritic porphyries are virtually cumulus product, and possibly experienced fractional crystallization of Cr-spinel + olivine + clinopyroxene during the magma chamber process. Moreover, the estimated primitive magma composition is picritic which is possibly produced by partial melting of the garnet-facies asthenospheric mantle peridotite. In combination with the available information including field observation and geochemical studies, e.g. fluid inclusions and stable isotope data, we infer that the deposit is hydrothermal in origin and the ore-forming fluids are predominantly primary magma-derived fluids which had been released during the post-magmatic period and mixed with fluids from country rocks.