Effects of water in lunar basalts

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Volatiles play important roles in phase equilibrium, magma genesis and transport. Owing to the previous concept of a 'bone-dry' moon, contrasting models are proposed for high-Ti basalt genesis, namely re-melting of ilmenite-rich cumulate by overturning versus assimilation by low-Ti melt. The debate between these two models is largely arisen because of the experimentally determined negative buoyancy of the dry high-Ti melt (e.g. [1]). Recently, significant water was discovered in the lunar glass beads and apatite [2-5], which transfers to existence of water in the lunar mantle. This would suggest a re-evaluation of lunar magma genesis and the density of high-Ti melt. Using the estimated initial water in very-low-Ti glass beads (primitive low-Ti melt) from Saal *et al*. [3], the mantle source rocks for these beads may contain 26-48 ppm H_2O if 10% partial melting is assumed. As ilmenite-rich cumulate forms after 95% crystallization of the LMO [7], the ilmenite-rich cumulate would have 520-960 ppm water. Assuming 10% melting, the high-Ti melt from the ilmenite-rich layer likely contains 0.5-1 wt% H_2O. This amount of water can decrease the density of high-Ti melt to a density (3240 kg/m^3) less than that for olivine (3300 kg/m^3) at 1500°C and 2 GPa, the solidus of high-Ti basalts. It is clear that the above calculation provides a promising first approximation on the initial H_2O content in high-Ti melts. Here, we review recent results of water in lunar samples and evaluate its effects on various aspects of lunar basalts.

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Geology and C, H and O isotopic geochemistry of Dongmozhazhua Pb-Zn ore deposit, Qinghai, China

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The Dongmozhazhua Pb-Zn ore deposit, located in the north of 'Three River' Pb-Zn-Cu-Ag metallogenic belt in Northeast Tibetan plateau, is controlled by the regional NW-SE thrust system. Ore bodies, hosted in limestone rocks of Late Triassic Bolila Formation and Early-Middle Permian Jiushidaoban Formation, are stratabound with colloform and xenomorphic grain textures and dissemination and breccia structures. Ores mainly consisted of sphalerite, galena, pyrite, calcite, dolomite and barite. The alteration types are strong dolomitization and weak silicification.

The H-O isotopic data of fluid inclusions in calcites (Fig.1a) indicate the fluid were mainly derived from pent-up water in the basin and partly from hydrothermal fluid. The C-O isotopic data of calcites and host limestone rocks (Fig.1b) indicate the dissolution of carbonate rocks have occurred during the ore-forming process. Therefore the fluid may have moved long distance in the basin after derived and got lots of ore-forming materials such as metals.

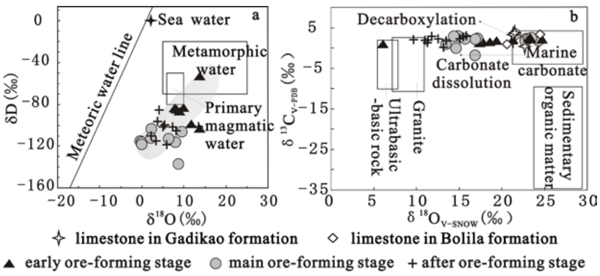

Fig.1 a-Diagram of $\delta D_{V\text{-}SMOW}$-$\delta^{18}O_{fluid}$ (Base diagram after[1]) and b-Diagram of $\delta^{13}C_{V\text{-}PDB}$-$\delta^{18}O_{V\text{-}SNOW}$ of calcites in the Dongmozhazhua deposit (Base diagram atter [2])

The geology and C-H-O isotopes of this deposit are similar to MVT deposits in the world [3], therefore the authors consider this deposit as a MVT-like Pb-Zn deposit controlled by the thrust systerm in the orogenic belt.

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