A P_{H_2O}-dependent structural phase transition in the zeolite natrolite

HSIU-WEN WANG* AND D. L. BISH

Dept. of Geological Sciences, Indiana Univ., 1001 E. 10th St., Bloomington, IN 47405, USA
(*correspondence: hw7@indiana.edu)

The crystal structures of natrolite and its dehydrated high-temperature phases (α1- and α2-metanatrolite) have been determined from powder X-ray diffraction (XRD) measurements as a function of temperature and partial pressure of H_2O (P_{H2O}) to characterize the phase transition behavior. The evolution of crystal structure as a function of temperature showed two very different phase transitions, depending on the P_{H2O} conditions, with α1-metanatrolite occurring at elevated P_{H2O} (Fig. 1A) and α2-metanatrolite occurring at low P_{H2O} (Fig. 1B). Our discovery of α2-metanatrolite implies the existence of more than one transition mechanism, which we correlate with the migration of Na^+ ions and the *rate* of evolution of H_2O molecules. The transition behavior can therefore be rationalized in terms of two cooperating mechanisms: (I) Dehydration-induced processes, which determine the phase transition temperature; (II) Thermally induced processes, which determine how the framework and its extraframework cations are modified.

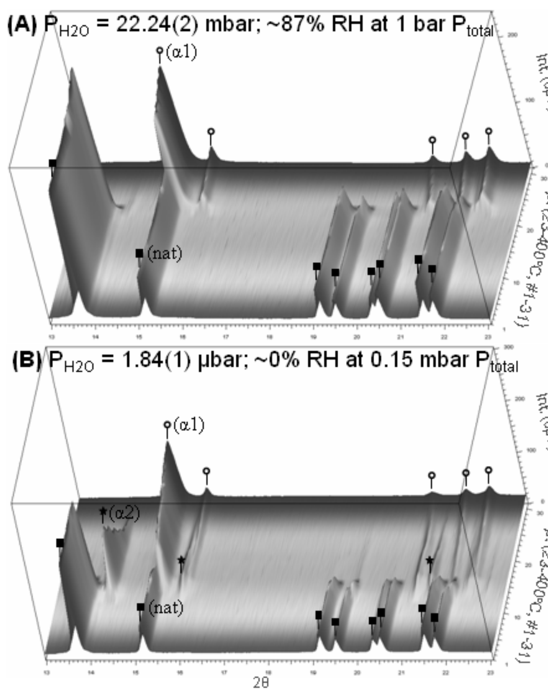

Figure 1: Temperature-resolved XRD data measured under different P_{H2O} conditions, showing the existence of two different phase transitions to α1 and/or α2.

Na-metasomatism of root facies of hydrothermal deposit in Xiaowan area, Southwest China

J. WANG*, R. HUANG AND Z. LI

State Key Lab. of Geohazard Provention, Chengdu Univ. of Technology, Chengdu, Sichuan, China 610059
(*correspondence: wangjingzhen078@sohu.com)

It is well knows that sodic fluid can leach many metals from wall-rock during Na-metasomatism in some ore deposits [1, 2]. But it is almost no chance to observe and research Na-metasomatism of ore deposit root facies due to it is placed in deep of ore forming system. There are many outcrops of sodic alterations in biotite granitic gneiss in Xiaowan area, Yun'nan, China. This offers a good opportunity to study metal leaching mechanism by Na-metasomatism.

The sodic alteration bodies have formed veins with length in 200 to 1200 m, width in several tens meters and depth in more than 300 m. They are mostly consisted of albitite. The albitite is almost totally consisted of albite, except several accessory minerals such as rutile and apatite. The rock typically possesses honeycomb structure.

It is identified that the albitite is altered from biotite granitic gneiss by Na-metasomatism. All of the K-feldspar, plagioclase and botite of gneiss were replaced by albitite. While quartz of gneiss were leached and dissolved during metasomatism, it caused honeycomb structure in albitite. It is demonstrated that all of the elements of Fe, Mg, Ca, Cu, Au, Rb, Ba and REE were released from gnesiss during Na-metasomatism. REE patterns also change a lot (Fig. 1). It is conclude through calculation that $100m^3$ biotite gneiss altered to albitite released 1300 kg Fe, 0.8 kg Cu, 0.007kg Au and 0.04kg REE to fluid. These elements can provide for ore forming in the upper part of the alteration. 0.04kg REE to fluid. These elements can provide for ore forming in the upper part of the alteration system.

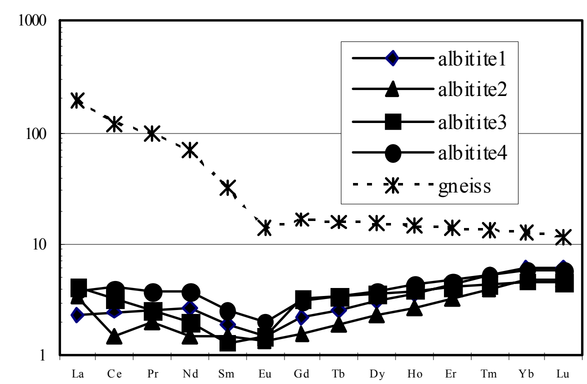

Figure 1: Chondrite-normalized REE patterns of gneiss.