Compositional Gap in Dioctahedral-Trioctahedral Smectite System: Beidellite-Saponite Pseudo-Binary Join

Hirohisa Yamada[1], Katsuaki Yoshioka[2], Kenji Tamura[3], Kazuko Fujii[1] and Hiromoto Nakazawa[1]

[1] National Institute for Research in Inorganic Materials, 1-1 Namiki, Tsukuba, Ibaraki 305-0044, Japan
[2] Nippon Paint Co. Ltd., 4-1-15 Minamishinagawa, Shinagawa-ku, Tokyo 140-0004, Japan
[3] Central Laboratory, Kawasaki, Showa Denko K.K., 3-2 Chidori-cho, Kawasaki-ku, Kawasaki 210-0865, Japan

E-mail of corresponding author: yamada@nirim.go.jp

Abstract: A series of hydrothermal experiments were performed to determine the phase relations on the beidellite-saponite pseudo-binary join. Quenched glasses with stoichiometric dehydrated compositions of an Na-rich smectite on the join were heated at 250 – 500 ° C for durations of 1 – 151 d at 100 MPa. Time-temperature diagrams showed that immiscibility occurs between dioctahedral smectite (beidellite) and trioctahedral smectite (saponite) below 400 ° C. Thus, smectite with intermediate chemical composition was considered as metastable in this system. Above 400 ° C the assemblage of regularly interstratified saponite-chlorite, quartz, and feldspar was recognized in the intermediate chemical compositional region of this join. On the beidellite side of this join, beidellite and mixed-layer phases of smectite and a regular interstratification of montmorillonite-beidellite, are possible phases that occur at <300 ° C. They readily reacted to form a mixture of dioctahedral rectorite plus quartz at 300 ° C. This assemblage then reacted to a dioctahedral " mica ", which can expand with glycol and quartz. On the saponite side of this join, a single phase, saponite, existed at <400 ° C, and transformed to saponite plus trioctahedral rectorite with aging and increasing temperature of synthesis. The alteration was affected strongly by the chemical composition of the binary system.

Key Words: Beidellite-Saponite Join • Compositional Gap • Hydrothermal Experiment • Mixed-Layer Phases

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