Clays and Clay Minerals, Vol. 45, No. 1, 114–115, 1997.

HUNGARIAN INVESTIGATIONS ON THE "ZEMPLENI" ILLITE

István Viczián
Hungarian Geological Institute, Stefánia út 14,
Budapest, H-1143, Hungary

Key Words—HRTEM, Hungary, Illite/Smectite, K/Ar Analysis, Locality, TEM, X-ray.

In recent papers dealing with the mineralogy of mixed-layer illite/smectites, a standard material called "Zempleni illite" frequently occurs (Środoń 1984; Ahn and Buseck 1990; Veblen et al. 1990; Reynolds 1992; Środoń et al. 1992). These papers mention that the material is a hydrothermal clay from Hungary provided by J. Środoń. Seemingly little is known about former Hungarian investigations carried out on this material. Most of these investigations were published only in local journals or conference reports, mainly in Hungarian. There are, however, a few papers that are at least theoretically accessible also for a foreign reader.

As for the locality, it seems to be certain that the locality of the so-called "Zempleni" illite is Füzérradvány. The term "Zempleni"—or, with correct orthography: "Zempléni"—is the name of the mountain range that includes the locality. This mountain range is situated in northeast Hungary and is built almost exclusively of Tertiary volcanics. The term "Zempléni Mountains" is used mostly in the geographic and touristic literature: in geology, the synonymous term "Tokaj Mountains" is used (referring to the center of the famous wine-growing district situated at the southern end of the range). Füzérradvány is a very small village and the nearest town in the district is Sárospatak. This is why in some old publications the illite from Füzérradvány was described as "sárospatakite" or "sarospatite". In the Tokaj Mountains, no other important locality of illite occurs; however, there are interesting occurrences of other hydrothermal clay minerals and zeolites (Mátyás 1979a, 1979b; Nemecz 1981). The geology of the Füzérradvány locality was described in detail in Mátyás (1979b).

The first important paper published on the mineralogy of Füzérradvány illite was that of Nemecz and Varju (1970). They described the history of investigations (pioneer studies by Maegdefrau and Hofmann, Sedlecky, Grim and Bradley), the mode of geological occurrence (with a geological section) and the basic mineralogy, including X-ray diffractometric, thermal and chemical investigations. They recognized the interstratified nature of the material and estimated the proportion of the expandable layers by the methods available in that time to 25–27%. They found a good relation between layer charge and K contents of these minerals.

Nemecz mentioned the Füzérradvány "illite" several times in his book (1981, p 336–343 and 464–469). He recognized the 1*M* polytypic modification and published transmission electron microscopy (TEM) photographs. He discussed the origin in the chapter on hydrothermal clays.

The mixed-layer nature of the material was more precisely determined in a more recent paper by Szegedi (1988). She used the direct Fourier transform method and the graphs published by Środoń (1980) and found the proportion of the expandable layers to be in the range 10–13% and the ordering of ISII type.

Dódony (1985) approximated to some extent the "fundamental particle" theory (Nadeau et al. 1984) on the basis of his high-resolution TEM (HRTEM) investigations.

The K/Ar age of the rhyolitic volcanism that provided the starting material for the hydrothermal alteration is in the range of 10 to 15 Ma (Pécskay et al. 1986, 1987).

The locality is still mined. Untreated, roughly ground raw material taken from the processing plant of E. Mátyás at Mád is available in limited amounts from the author of the present Note.

REFERENCES

Ahn JH, Buseck PR. 1990. Layer-stacking sequences and structural disorder in mixed-layer illite/smectite: Image simulations and HRTEM imaging. Am Mineral 75:267–275.

Dódony I. 1985. Transmission electron microscopic investigations of crystal chemical relations and lattice geometry of layer silicates [C. Sc. thesis]. Budapest: Hungarian Acad Sci. 3+115 p (in Hungarian).

Mátyás E. 1979a. Mining geology of the nonmetallic mining industry in the Tokaj Mountains. Földt Közl (Bull Hung Geol Soc) 109:488–506 (in Hungarian, English summary).

Mátyás E. 1979b. Guide to excursion in the Tokaj Mountains. Xth Kaolin Symposium, IGCP Project No. 23, Genesis of kaolin. Budapest. 63 p.

Nadeau PH, Wilson MJ, McHardy WJ, Tait JM. 1984. Interstratified clays as fundamental particles. Science 225: 923–925.

Nemecz E. 1981. Clay minerals. Budapest: Akadémiai Kiadó. 547 p.

Nemecz E, Varju Gy. 1970. Chemical and structural investigation of Sárospatakites (illite/montmorillonite). Földtani

Közlöny (Bull Hung Geol Soc) 100:11–22 (in Hungarian, English summary).

Pécskay Z, Balogh K, Széky-Fux V, Gyarmati P. 1986. Geochronological investigations on the Neogene volcanism of the Tokaj Mountains. Geologický Zborník–Geologica Carpathica 37:635–655.

Pécskay Z, Balogh K, Széky-Fux V, Gyarmati P. 1987. K/Ar geochronology of the Miocene volcanism in the Tokaj Mountains. Földtani Közlöny (Bull Hung Geol Soc) 117: 237–253 (in Hungarian, English and Russian summary).

Reynolds RC Jr. 1992. X-ray diffraction studies of illite/smectite from rocks, <1 μm randomly oriented powders, and <1 μm oriented powder aggregates: The absence of laboratory-induced artifacts. Clays Clay Miner 40:387–396.

Środoń J. 1980. Precise identification of illite/smectite interstratifications by X-ray powder diffraction. Clays Clay Miner 28:401–411.

Środoń J. 1984. X-ray powder diffraction identification of illitic materials. Clays Clay Miner 32:337–349.

Środoń J, Elsass F, McHardy WJ, Morgan DJ. 1992. Chemistry of illite-smectite inferred from TEM measurements of fundamental particles. Clay Miner 27:137–158.

Szegedi Á. 1988. Mixed layer character of "illites" from Füzérradvány, Hungary. In: Konta J, editor. Tenth Conf Clay Miner Petr. 1986; Ostrava. Praha: Univerzita Karlova. p 249–254.

Veblen DR, Guthrie GD Jr, Livi KJT, Reynolds RC Jr. 1990. High-resolution transmission electron microscopy and electron diffraction of mixed-layer illite/smectite: Experimental results. Clays Clay Miner 38:1–13.

(Received 12 April 1996; accepted 29 April 1996; Ms. 2760)