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THE ORIGIN OF FINELY CRYSTALLINE MICA FROM PODZOLS, TATRA MOUNTAINS, POLAND: PRELIMINARY RESULTS

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Finely crystalline mica is a common constituent of clay (< 2 μm) fractions from different soil types. It is widely accepted that it is mostly of inherited origin (e.g. Środoń, 1999; Wilson, 1999 and literature cited therein). The mica could also be deposited in soil environments as an airborne dust (e.g. Šucha et al., 2001). Soil illitisation was also suggested but not proved by many authors (e.g. Środoń, 1999 and literature cited therein) and wetting and drying in most cases is suggested as the possible illitisation mechanism. Smectite illitisation was systematically studied in laboratory conditions by Eberl et al. (1986). It was concluded that except for basic conditions it consists in reorientation of smectite layers from turbostratic to semi-ordered. According to Środoń (1999; 2003 personal communication) soil illitisation remains still one of the unsolved problems of clay mineralogy. Formation of illite in podzols from the Tatra Mountains was suggested by Oleksynowa and Skiba (1976).

This paper presents preliminary results of the research into the origin of finely crystalline mica from the podzol profile developed in the Tatra Mts. The studied weathering profile was selected because of its relatively high mica content and clear geological and mineralogical background. The profile consist of the podzol which is developed on the older weathering crust formed by physical disintegration during the Pleistocene. In the profile seven soil horizons were distinguished (OFH, OH, AE, Bhfe, Bs, Bs-C, C). Bulk soil samples as well as the separated clay fractions (< 2 μm and < 0.2 μm) were analysed with the use of XRD, FTIR and SEM-EDS methods. Optical microscopy observations of the parent rocks and K-Ar dating of the selected fractions were also performed. The amount of clay fraction measured after the Jackson treatment vary from approximately 8% in the lowest C horizon to near 15% in the upper albic E horizon. The clay fractions composition is typical of the Tatra podzols developed from the crushed or disintegrated tonalites with inherited chlorite, dioctahedral and trioctahedral micas present in the lower soil horizons and dioctahedral micas, mica/expandable and kaolinite occurrence in the upper soil horizons. The upper albic E horizon of the soil studied is relatively rich in dioctahedral micas. SEM-EDS observations indicates that most of the mica grains show the morphology typical for inherited micas with corrosion gulfs and frayed edges. The presence of fibrous like forms with the chemical composition close to Fe-illite which overgrow biggest mineral grains may indicate mica crystallisation from the soil solution. The fibres are < 0.2 μm. The K-Ar data obtained from the < 0.2 μm albic horizon fraction gave the age near 152 Ma which is much younger than 310–320 Ma obtained for tonalite primary micas (biotite and muscovite). The data is probably connected with the presence of the mixture of the older inherited primary mica and the younger mica. The younger mica may be of the soil origin as well as it may be inherited from sericite and secondary muscovite which was observed in the parent tonalite. The possibility of its aeolian origin have to be also considered. The origin of finely crystalline mica from the podzol studied remains unclear. Further investigations including detailed SEM-EDS observations as well as K-Ar dating of the soil, aeolian deposited mica and different generations of secondary mica from crystalline rocks are needed.

References

EBERL, D. D., ŚRODOŃ, J., NORTHROP, H. R. (1986): Geochemical processes at Mineral Surfaces. ACS Symposium Series, American Chemical Society, Washington D.C., 296–324.

OLEKSYNOWA, K., SKIBA, S. (1976): Studia Geomorphologica Carpatho-Balcanica, **10**, 27–47.

ŚRODOŃ, J. (1999): Use of clay minerals in reconstructing geological processes: Recent advances and some perspectives: Clay Minerals, **34**, 27–37.

ŠUCHA, V., ŚRODOŃ, J., CLAUER, N., ELSASS, F., EBERL, D. D., KRAUS, I., MADEJOVÁ, J., 2001: Clay Minerals, **36**, 403–419.

WILSON, M. J. (1999): Clay Minerals, **34**, 7–25.