POLSKIE TOWARZYSTWO MINERALOGICZNE – PRACE SPECJALNE
MINERALOGICAL SOCIETY OF POLAND – SPECIAL PAPERS
Zeszyt 22, 2003; Volume 22, 2003

Jacek DŁUGOSZ[1]*, Piotr MALCZYK*

THE CLAY MINERALS OF ENTISOLS FORMED FROM EOLIAN SAND NEAR BYDGOSZCZ TOWN

INTRODUCTION

The genesis of soils produced from eolian sands can be recognized by analysing their clay fraction, although due to quartz prevalence sandy fractions the dominating one. This fraction, in spite of its trace amounts, decides about different proprieties of these soils(e.g. sorption).

Found in subsurface horizons of soils formed from eolian sands, the clay fraction is a product of weathering and of pedogenetic processes, and only in surface horizon can it derive from the outside. The aim of this work is to determine mineralogical composition of clay fraction of soils formed from eolian sands and attempt to estimate the influence of braunification and podzolization on mineralogical composition of this fraction.

MATERIALS AND METHODS

A sequence of three soils were selected near the small villiage Stryszek, 4 km south away from Bydgoszcz. The selected pedons were localized at slopes (windward –profile 1 and leeward – profile 3) and top – profile 2 of parabolical diuna created during Young Dryas and Preboreal age (Mrózeka 1958).

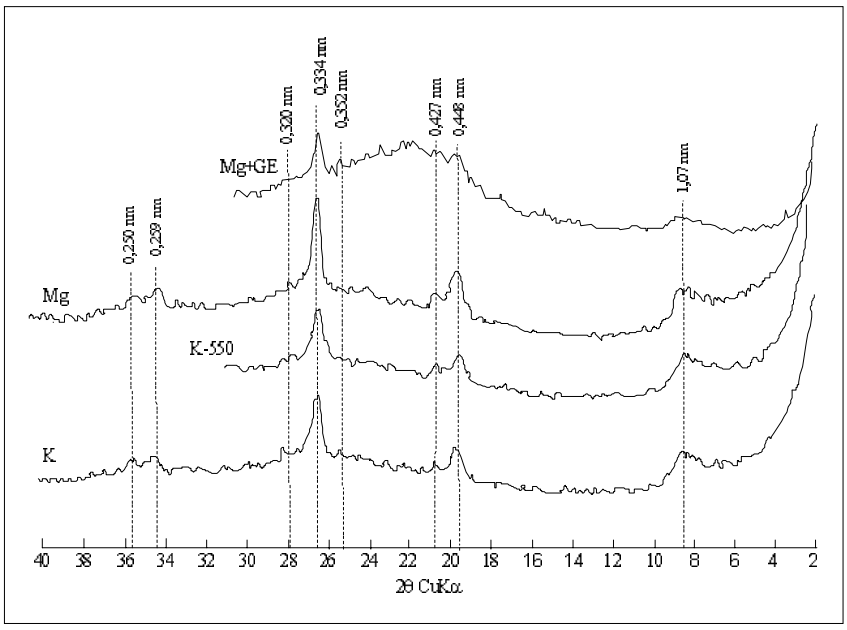
The analysed diuna showed unqual inclination slopes composed of fine sand (dominated content fraction 0.25-01 mm). Plants growing on this diuna were typical for coniferous forest and were represented by *Pinus silvestris* and *Junniperus communis.* The undergrowth level was represented by moss and grasses. The analysed soils were described as spodic Udipsamments (Soil Taxonomy 1999).

Soil samples were taken from each horizons, air-dried at room temperature and assed through a 1 mm sieve. The fraction below 1mm was dispersed with 0.25 M Na_2CO_3. The clay fraction was obtained by sedimentation after removing organic matter with 30 % H_2O_2 (Jackson 1956). The mineralogical content of this fraction was determined using XRD methods. X-ray diffractions diagram was obtained from oriented specimens using a HZG-4 diffractometr with Ni-filtered CuKα radiation. Pretreatments of the specimens included Mg saturation and

[1]*Kat. Gleboznawstwa i Ochrony Gleb, Akademia Techniczno-Rolnicza, Bernardyńska 6, 85-796 Bydgoszcz, jacekd@atr.bydgoszcz.pl*

solvation with ethylene glicol and also K saturation and heating at 550 ^{o}C.

a)



b)

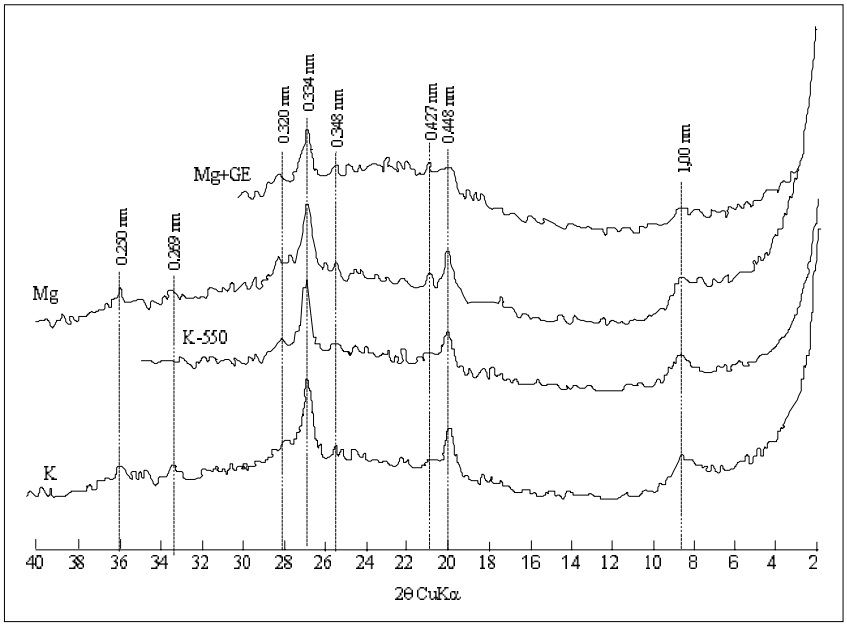


Fig. 1 Diffractograms of clay fraction from selected genetic horizons: a) C from profile 2, b) Br from profile 2.

RESULTS

Mineralogical analysis of clay fraction from all genetic horizons of the analysed soils shows prevailing amouts of dioctaedral micas (illite). A proof of it lays in that occurrence of reflexes 1.00 nm, 0.448 nm, 0.334 nm, 0.250 nm (Fig.1). These reflexes are characterized by little intensity and large width which can mean there occurred a considerable weathering in the analysed fraction of micas. These micas are also characterized by the lack of reflexes at d = 0.500 nm. The sign of this can be occurrence of reflexes in range 1.00 – 1.40 nm in Mg^{2+} preparations saturation and solvated with ethylene glicol (Fig.1). There are most likely minerals of illite/smectite type with not large amouts of smectite layers. Exact determination of these minerals is impossible due to performance little 001 reflexes intensity and lack of reflexes from further line. Accesoric minerals in analysed fraction are the following: quartz (0.427 nm, 0.334 nm), feldspars and plagioclase (0.402-0.406 nm, 0.369-0.362 nm, 0.329-0.318 nm) (Fig. 1). In samples of clay fraction deriving from horizons Br, trace amout of iron oxide (0.269 nm and 0.169 nm) was found. This is probably hematite but to confirm this, it is necessary to investigate further, using other methods

CONCLUSIONS

The conducted investigations showed lack of distinct profile differentiations in mineralogical composition of clay fraction of the analysed soils. In clay fraction of all genetic horizons, dominated illite of weakly crystallized structure. Young age these of soils can be explained by short time of their formations. These illites came into being probably as a result of tranformation of muscowite, the crystals of which were found in thicker fractions. A considerably large content of feldspars and plagioclase can be a proof for young age of these soils. The only difference observed between clay fraction derived from horizons Br and parent material is a greater content of iron oxides. Nevertheless, a more precise definition of there minerals will demand further investigation and the application of other methods.

REFERENCES

JACKSON, M.L., 1956: Soil chemical analysis – Advanced course. Published by author, Madison, Wisconsin.

SOIL SURVEY STAFF, 1999: Soil Taxonomy – second edition.USDA Washington.

MRÓZEK W., 1958: Wydmy Kotliny Toruńsko-Bydgoskiej. [In:] Wydmy Śródlądowe Polski cz. 2. R. Galon, PWN Warszawa, 7-59.