Nature and Origin of Beidellite mineral in Some Iraqi Soils

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Summary:

This study was conducted to reveal the distribution of beidellite clay mineral in some Iraqi soils and to clarify some of its characteristics behavior and origin.

Seven pedons were selected from different geological formations of Iraq. Two pedons representing the young alluvial soils of Mesopotamian flood plain, the first was formed from Tigris deposits, whereas the second was formed from Euphrates deposits. These two pedons were classified as TYpic Torrifluvents. The others were developed soils and formed from old alluvium at different geological times. The developed soils were represented two different geological formations these are Injana and Al-Fatha formations. Developed soils were sampled from two different isohyte lines (380 and 600 mm/year). These two soils were classified as vertic Haploxerolls, Xeric Haplocalcid and Xeric Haplocambid.

Pedons were morphologically described and sampled. Soil samples were air dried and crushed to pass through 2 mm sieve before using for clay mineralogy studies.

The clay mineralogy of soils showed large similarity and can be summarized as following:

Chlorite, mica and kaolinite were dominant clay mineral in sand, coarse and medium silt in addition to quartz, paligorskite and K-feldspars, whereas fine silt had the same clay mineralogy composition of coarse fractions in addition to minor amount of beidellite. Coarse clay was composed of chlorite, illite, kaolinite and beidellite with trace amount of interstratified layers of mica-smectite. Fine clay had a same clay mineralogy as coarse clay except that beidellite was the dominant mineral and the presence of trace amount of palygorskite.

Results indicate that beidellite in these soils had a highly charged layer with large heterogenity. Fine clay had a high CEC and large tendency for K fixation.

Soil solution examination of some studied soils explained that these soils had a neutral to alkaline reactions with low concentrations of soluble silicon and aluminum which reflect a weak weathering in these soils.

Magnesium and silicon activites were calculated by using Wat Qut computer program. Stability diagram was developed by using pH-½ pMg On the ordinate and pH_4SiO_4 on the abscissa. Results showed that the samples were in the montmorillonite stability well away from the kaolinite –montmorillonite join. This result reflected that the clay minerals was stable and in equilibrium with soil environment, but doesn't mean that beidellite mineral was formed authigenically because of low concentrations of soluble Si and Al. We can concluded from the low concentrations of soluble silicon that soil environment was unfavorable for montmorillonite formation. The presence of beidellite clay mineral in C_2 horizons of the studied soils refers that minerals was mainly inherited from parent material. The reverse distribution of of illite and beidellite in the surface and subsurface horizons of developed soils pointed out that this mineral may be formed from illite transformation.