
Trace Element Concentration in Amorphous Clays of Volcanic Ash Soils in Oregon*

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Abstract: Clay fractions in soils from a transect of the Mazama ash deposit (6600-yr-old) contained more than 80% amorphous material. Instrumental neutron activation analysis was used to compare the trace element composition of the soil clay with the unweathered volcanic glass. The clay fractions had only 10% as much Na as the volcanic glass. Conversely, the rare earth element concentrations were about three times greater and the transition metal concentrations were up to nine times greater in the clay than in the glass. The < 2 μ size fraction therefore contained mostly weathering products rather than fine glass.

The abundances of Cr, Co, Sc, and Fe in the clay fraction decreased with depth. The Sc/Fe ratio was approximately 4×10^{-4} for both clay and the unweathered glass. The relationship between elemental concentration in clay and fine sand size separates from the same soil horizons indicated that the clay exists in association with the larger size particles, probably as coatings.

Dilute nitric acid removed about 80% of the rare earth elements La, Nd, Sm, Eu, Tb, Yb, and Lu from the clay. Deferration was necessary to remove Ce, a rare earth element that forms insoluble oxides upon oxidation to the Ce⁴⁺ state. The residue of the KOH dissolution treatment contained 2:1 layer silicates that may be derived from primary biotite.

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