Chapter 18

Zeolites in Soils

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In the last 25 yr, zeolite minerals have been recognized with increasing regularity as common constituents of Cenozoic volcanogenic sedimentary rocks and altered pyroclastic rocks (Hay, 1966; Mumpton, 1973, 1978; Munson & Sheppard, 1974). Their occurrence in soils, however, is not as well known and has received little attention by geologists and soil scientists. In the course of this investigation, over 50 papers were encountered that describe members of this group of hydrated aluminosilicates of alkali and alkaline earth cations in soils ranging from Mollisols of Texas to cold, arid soils of Antarctica. Most of these reports discuss residual zeolite phases that remain during weathering of parent rocks that are themselves rich in zeolites (generally of volcanic origin); but several occurrences of zeolites crystallizing in situ from strongly alkaline soil solutions have been reported.

The unique cation-exchange, adsorption, hydration-dehydration, and catalytic properties of natural zeolites and their abundance in flat-lying, near-surface, and near-monomineralic deposits have prompted their use in recent years in a wide variety of agricultural processes—as soil amendments, slow-release fertilizers, dietary supplements in animal nutrition, carriers of insecticides, herbicides, and fungicides, and deodorizers and moisture-control agents for animal manures (Mumpton & Fishman, 1977; Pond & Mumpton, 1984).

Soil scientists undoubtedly will encounter zeolite minerals more and more frequently in future years either as natural components of soils or as a result of their having been introduced into soils by humans, in efforts to increase plant and animal productivity. The following chapter therefore has been prepared as a review article to acquaint soil scientists with the zeolite group of minerals—their composition, crystal structure, physical


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