
Geochemistry and Mineralogy of an Unusual Diabase Saprolite Near Columbia, South Carolina

L. R. Gardner, I. Kheoruenromne¹ and H. S. Chen

Department of Geology, University of South Carolina, Columbia, South Carolina 29208

¹ Present address: Department of Soils, Kasetsart University, Bangkok-9, Thailand.

Abstract: Empirical reaction progress diagrams showing the trends of major element oxide concentrations (in g/cm³) as functions of bulk density for a diabase saprolite reveal discontinuities in the trends of Al₂O₃, MgO, H₂O+, and nonextractable Fe₂O₃. The discontinuities coincide with discontinuities in the trends of (1) the kaolinite-smectite 001 peak-intensity ratio, (2) the smectite 002-001 peak intensity ratio, and (3) the smectite basal spacing as functions of bulk density. The discontinuities are apparently related to redox conditions in the weathering profile because they occur at a depth where siderite veins first appear in the saprolite. Oxidizing conditions in the upper part of the profile appear to have favored the formation of Ferich smectite over kaolinite, whereas reducing conditions deeper in the profile favored the formation of kaolinite over Al-rich smectite. These results indicate that where geochemical conditions favor retention of Fe over Al, smectites can form in preference to kaolinite or gibbsite even under conditions of strong leaching.

Key Words: Bulk density • Diabase • Kaolinite • Oxidation • Saprolite • Smectite • Weathering

Clays and Clay Minerals; June 1981 v. 29; no. 3; p. 184-190; DOI: [10.1346/CCMN.1981.0290303](https://doi.org/10.1346/CCMN.1981.0290303)

© 1981, The Clay Minerals Society

Clay Minerals Society (www.clays.org)
