# Weathering of Iron-Bearing Minerals in Soils and Saprolite on the North Carolina Blue Ridge Front: II. Clay Mineralogy

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**Abstract:** The mineralogy of the clay fraction was studied for soils and saprolite on two Blue Ridge Front mountain slopes. The clay fraction contained the weathering products of primary minerals in the mica gneiss and schist parent rocks. Gibbsite is most abundant in the saprolite and residual soil horizons, where only chemical weathering has been operable. In colluvial soil horizons, where both physical and chemical weathering have occurred, the clay fraction consists largely of comminuted primary phyllosilicates —muscovite, chlorite, and possibly biotite—and their weathering products: vermiculite, interstratified biotite/vermiculite (B/V), and kaolinite. The clay-size chlorite contains $Fe^{2+}$ as indicated by Mössbauer spectroscopy, and is more resistant to weathering than biotite. The vermiculite and B/V, both weathering products of biotite, contain $Fe^{3+}$. Vermiculite in colluvial soils and, especially, surface horizons is weakly hydroxy-interlayered. The kaolinite in the clay fraction resulted at least partly from the comminution of kaolinized biotite in coarser fractions.

The hematite content ranged from 0 to 8% of the clay fraction and strongly correlates (r = .95) with dry clay redness, as measured by the redness rating: RR = (10 - YR hue) × (chroma) ÷ (value). The hematite is largely a product of the weathering of almandine; thus, the soil redness is dependent on the amount of almandine in the parent materials and its degree of weathering in the soils. Goethite (13 – 22% of the clay fraction) imparts a yellow-brown hue to soils derived from almandine-free parent rocks. The release of Fe in relatively low concentrations during the weathering of Fe-bearing primary minerals, particularly biotite, appears to have promoted the formation of goethite.

**Key Words:** Chlorite • Goethite • Hematite • Iron • Kaolinite • Mössbauer spectroscopy • Saprolite • Soils • Vermiculite • Weathering

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