Weathering of Basalt: Changes in Rock Chemistry and Mineralogy

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Abstract: The weathering of eastern Australian basalts, sampled from the rounded, hard, core-stone to the rind of softer weathered material, has been examined by bulk chemical analyses, thin section petrography, electron microprobe, and X-ray powder diffraction analyses. Using density as a measure of weathering intensity, data from four core-stones show that at a stage of weathering in which the total loss due to dissolution is ⅓ (i.e., at the core-stone rim), the percentages lost of the following major elements are: Ca, 85; Mg, 80; Na, 70; K, 50 – 80; P, 55; Si, 45; Mn, 40; Al, 5; Fe, 0; and Ti, 0. With more intense weathering, deposition of some elements, particularly rare earths and Ba, and mobilization and deposition of Al and Fe make quantification impossible. The rate of weathering of individual minerals is consistent with the well-known susceptibility series: glass ~ olivine > plagioclase > pyroxene > opaque minerals. Clay minerals in the core-stones are dominated by smectites, whereas those in the surrounding more intensely weathered rinds are dominated by halloysite and goethite.

Key Words: Basalt • Core-stone • Element mobilization • Goethite • Halloysite • Smectite • Weathering

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