THE IGWISI HILLS EXTRUSIVE "KIMBERLITES"

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The Igwisi Hills are a group of volcanic hills in Tanzania where a unique series of eruptions has produced volcanic rocks that have many of the features of kimberlites. The rocks are "igneous conglomerates" that are characterized by the presence of abundant oblate spheres of olivine in a fine grained crystalline matrix. The matrix contains major amounts of carbonate and complexly-zoned Mg-Al-Cr spinels, minor perovskite, apatite and limonite. The larger grains are magnesian olivines that are highly rounded and show strain effects. Some of the original olivine spheres have partially recrystallized to more Fe-rich and Ni-poor anhedral to euhedral grains. Several olivine ellipsoids are partly or wholly rimmed by a black coating consisting of perovskite, ilmenite, and Mg-Al spinel. Special attention has been given to the study of mineral inclusions within the olivine. These include chrome pyrope, similar in composition to garnets in kimberlites, low Al enstatite, low Al magnesian chrome diopside, Mg-Al chromite, and a highly magnesian phlogopite (Mg/Mg+Fe $\sim$ .93). All of these are apparently primary phases in equilibrium with olivine. The total assemblage is similar in many respects to that found in peridotite xenoliths from the Lashaine volcano in northern Tanzania.

The Igwisi irruptives thus apparently contain material derived from phlogopite-bearing, garnet and/or spinel peridotites with a primary mineral assemblage (assuming that these phases coexist) indicative of equilibrium at upper mantle temperatures and pressures. This primary assemblage was disrupted and brought rapidly to the surface in a gas-charged, carbonate-rich fluid. Abrasion of the ultramafic xenoliths to produce smoothly rounded pebbles suggests energetic transport in a fluidized system. Transport and cooling were sufficiently rapid (possibly due to continuous endothermic expansion of the gas-rich medium) to prevent both re-equilibration of the high pressure phases and major reaction between xenoliths and the fluid. Rapid upward transport, extrusion, and rapid cooling have preserved inclusions of upper mantle peridotite in a carbonate-rich matrix and have tended to prevent the reaction between inclusions and matrix that would otherwise have yielded a more typical kimberlite.