

Basalts from Rose Atoll, American Samoa

K.A. RODGERS¹, F.L. SUTHERLAND^{2*} AND P.W.O. HOSKIN³

¹ Research Associate, Australian Museum, 6 College Street, Sydney NSW 2010, Australia

² Geodiversity Research Centre,
Australian Museum, 6 College Street, Sydney NSW 2010, Australia
lins@austmus.gov.au

³ Institut für Mineralogie, Petrologie und Geochemie,
Albert-Ludwigs Universität Freiburg, Albertstrasse 23b, D-79104 Freiburg in Breisgau, Germany

ABSTRACT. Three specimens of lava float collected in 1939 from Rose Atoll consist of three distinct basalt types: holocrystalline olivine tholeiite, coarse vesicular picrite basalt and olivine-poor transitional basalt; the tholeiite contains coarser, late-stage segregations with a glassy, silicic mesostasis. In mineralogy and chemistry these basalts most closely resemble Ta'u Group lavas of the neighbouring Manu'a Islands. Differences exist that do not suggest their transport to Rose Atoll, even though no in situ basalts are known there. Incompatible primitive mantle-normalized trace element plots show strong depletion in K and Sr and enrichment in U, Pb and La. In Ba/Nb versus La/Nb plots Rose basalts lie between normal mid-ocean ridge basalt (N-MORB) and low ⁸⁷Sr/⁸⁶Sr oceanic island basalt (OIB) fields. They lie outside many plume-related OIB fields, including plume-related Samoan basalts. Trace element ratios for the Rose samples show little correspondence with end member MORBs and OIBs. This, and temporal and geographic plume reconstructions, indicate that the Rose basalts are derived from melting of unusual or mixed lithospheric sources. They seem unrelated to the main phases of Samoan plume activity, now located at Vailulu'u Seamount.

RODGERS, K.A., F.L. SUTHERLAND & P.W.O. HOSKIN, 2003. Basalts from Rose Atoll, American Samoa. *Records of the Australian Museum* 55(2): 141–152.

Basalts found on Rose Atoll, American Samoa, present an enigma. To date petrologists have overlooked the seemingly conflicting reports of infrequent expeditions to the island (Sachet, 1954, 1955; Keating, 1992; Rodgers *et al.*, 1993). Yet, given the geographic position at the eastern end of the Samoan chain, the age and nature of any basalts there are important in constraining the tectono-volcanic evolution of this chain. Only one brief description of a thin section of Rose basalt exists (Sachet, 1954). Here we present petrographic descriptions and chemical data for three samples from Rose held by the Smithsonian Institution

(NMNH no. 102227) —the only known captive samples. From this we offer an assessment of their possible provenance.

Rose Atoll

Rose Atoll (14°32'S 168°08'W) lies 240 km ESE of Pago Pago at the eastern end of the Samoan Islands, part of a 1700 km long chain of seamounts, shallow banks and submerged atolls (Fig. 1). These volcanic features show an orientation consistent with their potential generation by