Highest measured strontium isotope ratios in Icelandic rocks: Rb and Sr systematics in Ljósufjöll volcanics, Snæfellsnes peninsula.

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Silicic rocks in Iceland older than Holocene have not reached much attention in the last three decades. A renewed interest in these rocks is provoked by recent emphasize on early Earth processes and the idea that Iceland and its geological phenomenon may be an analogue for those processes. Here, we present our first results on Ljósufjöll that is one of three Quarternary volcanic systems on Snæfellsnes peninsula, with a center consisting mostly of intermediate and felsic rocks. Six whole-rock samples, which are representative of the youngest geological formations, have been collected for detailed geochemical study. Strontium and Rb concentration and isotope ratios of Sr and Nd were measured by isotope dilution and thermal ionization mass spectrometry (at LMV, Clermont-Fd). The Rb/Sr and $^{87}Sr/^{86}Sr$ range from 0.116 to 153 and 0.70350 to 0.70476 (±0.00002; 2SE), respectively, making them the highest Rb/Sr and Sr isotope ratios yet measured in Icelandic rocks.

Four possible explanations for these high ratios are being tested: 1) partial melting of enriched mantle domains beneath Snæfellsnes, 2) partial melting of rather radiogenic crust, 3) extensive fractional crystallization in a magma chamber and radiogenic in-growth of ^{87}Sr from ^{87}Rb and 4) post-eruptional contamination of oceanic origin. The first and second possibilities are unlikely since $^{143}Nd/^{144}Nd$ are not particularly low in the same samples and similar to values measured in other Icelandic lavas in which Sr and Nd isotope ratios display strong co-variations. The low Sr concentrations in our samples make them vulnerable to rainwater contamination. However, all samples were taken from the interior of large non-porous blocks in order to minimize potential alteration. Our preferred explanation for the high Rb/Sr and $^{87}Sr/^{86}Sr$ in the silicic rocks of Ljósufjöll is extreme fractional crystallization and post-eruptional radioactive decay of ^{87}Rb. In this case, the approximate age of the youngest silicic formations ranges from 120 ka to 1.5 Ma. These results clearly show that variability in Sr isotope ratios in Icelandic rocks is much greater than expected from earlier studies, and illustrate the potential of ^{87}Rb-^{87}Sr systematics in dating and studying petrogenesis of older silicic formations in Iceland.