First report on Hawaiian carbonatites

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Carbonatites are common in continental settings but have, so far, only been identified at two oceanic localities, the Cape Verde and Canary Islands, both resting on > 130 Ma old, thick and cool oceanic crust. Here, we report on the first carbonatites observed in a hotter and younger mid-ocean setting, occuring as xenolithic fragments in nephelinitic tuffs at Salt Lake Crater (SLC), Oahu, Hawaii. The existence of Hawaiian carbonatites has been hypothesized before from various lines of evidence: (1) production of carbonatitic melts require carbonate in their source[1]; (2) diamond and SiC-bearing SLC xenoliths indicate mixed carbonatitic-silicic metasomatic agents in the sub-Hawaiian mantle[2] and (3) so do trace element compositions of Niihau[3] and SLC[4] post-erosional magmas.

The potential role of mantle carbonatites on assimilation-fueled ascent of kimberlitic magmas has been the subject of two recent experimental studies[5,6]. For experimental reasons, both these experiments failed to reproduce conditions prevailing at mantle depth by applying either too low pressure of 1 atm[5] or using Na_2CO_3 as a substitute for Ca-Mg carbonate[5,6]. Here, we show the CO_2 producing reaction $CaCO_3$ + Opx → Cpx + CO_2 "caught in the act" and *in-situ* in sub-Hawaiian carbonatite bearing xenoliths. We document the reaction by means of SEM and TEM analyses and discuss the carbonatites' isotope composition for C, O and Sr with respect to their parentage.

[1] Brey, *J. Volc. Geoth. Res.* **3**, 61-88, 1978. [2] Wirth & Rocholl, *Earth Planet. Sci. Lett.* **211**, 257-269, 2003. [3] Dixon *et al*, *Geochim. Geophys. Geosyst.* **9**, 1-34, 2008. [4] Rocholl *et al*, *Ann. Meeting German Mineralog. Soc.* (DMG) 2014, **144**.[5] Russel *et al*, *Nature* **481** (2012), 352-356. [6] Kamenetsky and Yaxley, *Geochim. Cosmochim. Acta* **158** (2015), 48-56.