

Supplementary Material 2. Microprobe analyses (wt%) of the *fayalite*, *laihunite* and *oxyfayalite* zones and of *osumilite* in the lithophysae from Obsidian Cliffs' rhyolite. The theoretical compositions of *fayalite* Fe_2SiO_4 , *laihunite* $\text{Fe}^{2+}\text{Fe}^{3+}_2\text{Si}_2\text{O}_{10}$ and "*ferrifayalite*" $\text{Fe}^{3+}_4\text{Si}_2\text{O}_{10}$ are indicated for comparison, as well as the composition of natural osumilites from other locations.

Phase	Origin	Ref.	n	SiO ₂	TiO ₂	Al ₂ O ₃	FeO _{tot}	MnO	MgO	CaO	Na ₂ O	K ₂ O	Total
fayalite	Obsidian Cliffs	[1]	6	31.1(0.4)	-	0.0	57(3)	5(1)	7(2)	-	-	-	99.9(0.7)
	Theoretical	-		29.49	-	0.0	70.51	0.0	0.0	-	-	-	100.0
laihunite	Obsidian Cliffs	[1]	9	34.3(0.2)	-	0.0	60.4(0.3)	0.45(0.05)	0.14(0.05)	-	-	-	95.4(0.4)
	Theoretical	-		34.17	-	0.0	61.28	0.0	0.0	-	-	-	95.5
"oxyfayalite"	Obsidian Cliffs	[1]	17	35.8(0.3)	-	0.11(0.05)	57.7(0.3)	0.27(0.09)	0.06(0.03)	-	-	-	94.0(0.5)
"ferrifayalite"	Theoretical	-		36.08	-	0.0	57.52	0.0	0.0	-	-	-	93.6
osumilite	Obsidian Cliffs	[1]	15	60.6(0.4)	0.04(0.03)	21.7(0.5)	9.4(0.4)	1.04(0.9)	3.3(0.3)	0.05(0.03)	0.03(0.02)	3.3(0.2)	99.4(0.4)
	Obsidian Cliffs	[2]		61.8	0.11	21.8	8.25	0.98	3.5	0.11	0.27	3	99.8
	Monte Arci	[2]		61.2	0.12	22	9.93	0.74	2.9	0.14	0.35	3	100.4
	Monte Arci	[3]	9	61(1)	0.02(0.01)	20.8(0.3)	10.3(0.2)	0.63(0.03)	2.87(0.04)	0.02(0.01)	0.09(0.02)	3.33(0.07)	99.25
	Ngongotaha	[4]		60.35	0.00	24.40	2.82	2.96	5.31	0.00	0.46	3.33	99.63

n is the number of analyses.

Mean weight fraction is reported for each oxide, as well as the standard deviation (1 sigma, in parentheses).

References: [1] this study [2] Olsen and Bunch 1970 [3] Elmi et al. (2010) [4] Grapes et al. (1993)