



Possible magmatic contribution of metals into the hydrothermal systems at the Menez Gwen and Lucky Strike vent fields, Mid-Atlantic Ridge: observations from melt inclusions in plagioclase phenocrysts

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Fresh porphyritic basaltic rocks dredged in the vicinity of the active vent areas of two hydrothermal systems on the Mid-Atlantic Ridge, Menez Gwen (37°50'N) and Lucky Strike (37°17'N), were selected for mineralogical and geochemical studies. Bulk-rock geochemistry indicates that the basalts from Menez Gwen and Lucky Strike have similar compositions and are enriched in incompatible elements (Cs, Rb, Ba, K, Pb) and LREE ($2.47 < La/Sm_N > 3.30$) denoting an E-MORB signature. Only two samples from Menez Gwen deviate from these compositions being less enriched in incompatible elements and LREE ($1.76 < La/Sm_N > 1.78$). Textures, however, vary and basalt groundmasses can be crystalline with olivine and plagioclase phenocrysts or glassy to microcrystalline with olivine and plagioclase, plagioclase and clinopyroxene or olivine, plagioclase and clinopyroxene phenocrysts. Vesicles vary considerably in size and frequency, from abundant large coalesced vesicles with glassy rims to small and rare. Plagioclase is the dominant phenocryst phase followed by olivine and, less commonly, clinopyroxene. Plagioclase phenocrysts exhibit complex geometry with zoning (core, mantle, internal rim and external rim), resorbed boundaries or skeletal shapes. Although texturally complex, plagioclase is compositionally homogeneous ($\sim An_{89}$). Melt inclusions (MI) occur in impressive amounts in plagioclase phenocrysts and less commonly in olivine and clinopyroxene. MI were carefully studied with a petrographic microscope and then measured using image analysis software. Devitri-

fied MI within plagioclase phenocrysts are ubiquitous in all basalt samples whereas glassy MI with bubbles are not so common though always texturally associated with the devitrified MI. Devitrified MI are smaller ($\sim 153 \mu\text{m}^2$; $n=1422$) than glassy MI's with bubbles ($\sim 220 \mu\text{m}^2$; $n=182$). MI volume (V_{MI})/Bubble volume (V_b) ratios are not constant suggesting heterogeneous trapping of coexisting phases due to separation of the vapor phase within the pre-erupted magma. SEM-EDS analyses of the interiors of vapor bubbles, exposed in polished thin sections, revealed precipitates containing S, Fe, Cu and Ni. Results are preliminary but suggest the existence of a high temperature, metal-rich fluid in the pre-erupted magma of the Menez Gwen and Lucky Strike hydrothermal systems.