Primary andesite melts: New insight from NW Rota-1 volcano

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NW Rota-1 volcano is an active submarine volcano in the Southern Seamount Province of the Mariana arc [1]. Using JAMSTEC's ROV, a total of 42 rock samples were collected from the summit region (531-1080 mbsl) and near the base (1474-2260 mbsl) of the volcano. These lavas are medium-K basalts and andesites with 51.5-58.2 wt% SiO_2. We note, that lavas ranging from 54-57 wt% SiO_2 are conspicuously absent and that most lavas tend to cluster at 52 and 57 wt% SiO_2. In constrast, melt inclusions trapped within olivine grains from the same lavas span a much wider range (48.7 to 56.9 wt% SiO_2) and show a continuous range (i.e., no gaps). Here we explore why this difference is observed and evaluate whether melt inclusions record primary andesite melt compositions.

Major element compositions of melt inclusions are based on volatile-free compositions, normalized to 100% with total iron calculated as FeO. Estimated primary magmas of these melt inclusions range from basalt to magnesian andesite (48-55 wt% SiO_2) and, interestingly, these compositions are similar to compositions of melts formed by partial melting of peridotite under hydrous conditions [2]. Water contents of melt inclusions range from 1.1 up to 5.8 wt% H_2O [3] and we suggest that compositions could represent primary melts. We reject the possibility that melt inclusions are simply recording differentiation processes since the range in SiO_2 is found over a relatively narrow range of MgO contents.

If melt inclusions are recording a wide range of primary melts composition, why do complementary lavas record such a restricted range of compositions? One possible explanation is that lavas have experienced late stage differentiation processes, obscuring primary source compositions (e.g. Tamura *et al.* [4]). Pyroxenes found in lavas show compositional zoning and based on thermometry estimates [5], suggest cool core temperatures 800-900°C, as compared to their rims (1000-1100°C). We suggest that low temperature, water-rich andesite magmas stalled at depth, but were later reheated and remobilized by partial melting within the crust.

[1] Embley *et al.* (2006) *Nature* **441,** 494-497. [2] Kushiro (1990) *J. Geophys. Res.* **95,** 15929-15939. [3] Shaw (2006) *Eos Trans. AGU, 87*(52) [4] Tamura *et al.* (2003) *J. Petrol.* **44,** 2243-2260. [5] Lindsley & Andersen (1983) *J. Geophys. Res.* **88,** 887-906.

H, O, Sr isotopic constraint on evolution of the oilfield brines in the western Qaidam Basin, China

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Background

During the prospecting and exploration for oil and gas in the western Qaidam Basin, China, much oilfield brine was discovered in the Tertiary strata, which will likely make up for the limited salt lake resources in future [1], but to nowadays, about its origin source and formation are still unclear. Based on some brine samples collected from petroleum drills, their composition of strontium, deuterium and oxygen isotopes were measured in order to trace their origin, formation and resource distribution.

Discussion of Results

The oilfield brines show with heavier compositions in $\delta^{18}O$ values (from 0.47‰ to 15.89‰) and lighter composition in δD values (from -50‰ to -27‰), which deviate from the global and Qaidam Basin meteoric water lines and show positive oxygen excursion. $^{87}Sr/^{86}Sr$ values in oilfield brines range from 0.711163 to 0.712396. With respect to typical end-members of the strontium isotopes in lithosphere source (average value is 0.720) and mantle source (average value is 0.704), the $^{87}Sr/^{86}Sr$ ratios are just intervenient between them. Thus it can be proved by H, O and also Sr isotopes that the oilfield brines origin from two mixing end-members: deep mantle fluid and lithosphere source fluid. Then we conclude that a large supply source for the brines and the foreground of the brine exploration should be expected.

[1] Tan *et al.* (2007) *Journal of Palaeogeography* **9**(3), 313-320.