

Tracing the “slab component” in arc lavas using Ce/Mo

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Arc lavas exhibit a characteristic geochemical signature, which is typically ascribed to fluids or hydrous melts that originate from the heated subducting slab. Recently, Freymuth et al. [1] have demonstrated the ability of Mo isotope and Ce/Mo ratios in tracing the slab component in the Marianas arc. In a companion study, we have analysed a suite of sediments and primitive arc lavas from the Lesser Antilles (Freymuth et al. this volume). The isotopic and trace element pattern of the northern islands are found to be consistent with a major fluid component from the basaltic crust, similar to what is found in the Marianas ($\delta^{98/95}\text{Mo}$ slightly heavier than source MORB; Ce/Mo \approx 0). Southern islands, in turn, are characterized by high Ce/Mo, as well as unusually high $\delta^{98/95}\text{Mo}$ values. Isotopically, the source of the high $\delta^{98/95}\text{Mo}$ is suitably well explained by euxinic sediments that have previously been suggested to contribute to the sources of the southern Lesser Antilles lavas [2]. The reason for the variable Ce/Mo fractionation, however, remains unknown.

This study is therefore dedicated to identifying possible hosts for Mo and Ce in sediments at sub-arc depth. New piston cylinder experiments are performed (3 GPa, 800-900°C), using synthetic compositions that mimic sediments drilled in the vicinity of the Lesser Antilles arc. We found that sulphide and rutile are major hosts for Mo, whereas the presence or absence of monazite (Ca-poor sediments) and epidote (Ca-rich sediments) control Ce concentrations. Redox conditions are found to be of great importance for Ce/Mo ratios because of its influence on sulphide (and epidote) stability. Experimental run products further imply that rutile only hosts Mo at suitably reducing conditions where it should occur at Mo^{4+} (rather than Mo^{6+}). The combination of Ce/Mo with experimental results thus place constraints on phase petrology and redox conditions in the subducted slab.

[1] Freymuth et al. (2015) *EPSL* **272** 199-211.

[2] Carpentier et al. (2008) *EPSL* **432** 176-186.