# Water contents of natural zircons are controlled by their Y+REE contents

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The water and trace element contents of non-metamict igneous zircons were determined to constrain the H incorporation mechanism and to evaluate the use of zircon to constrain water contents of melts [1]. Zircons from Fe-Ti oxide gabbros from the Vema Fracture Zone [2] contain up to 980 ppm $H_2O$, 1.4 wt% $Y_2O_3$ and 0.6 wt% $P_2O_5$ and are generally strongly zoned. Y+REE are partially charge-balanced by P ($Y^{3+}+P^{5+}=Zr^{4+}+Si^{4+}$) but a large Y excess is present (Fig. 1A). On an atomic basis, this excess closely matches the amount of H present in the zircons (Fig. 1B). We therefore conclude that H is incorporated by a charge-balance mechanism ($H^{+}+Y^{3+}=Zr^{4+}$). This is supported by FTIR data, which show a strongly polarised absorption band at 3100 $cm^{-1}$ similar to experimental Lu-doped hydrous zircons. No other absorption bands are visible, excluding a hydrogrossular-type exchange mechanism. Because of charge-balanced uptake of H, P and Y+REE in zircon, the partitioning of these elements into zircon is dependent on each of their concentrations. Hence, using H in zircon to determine water contents of melts is challenging. As $Ce^{4+}$ partitioning is not affected, Ce anomalies may depend on $H_2O$ and $P_2O_5$ contents of the melt, in addition to its oxidation state [3].

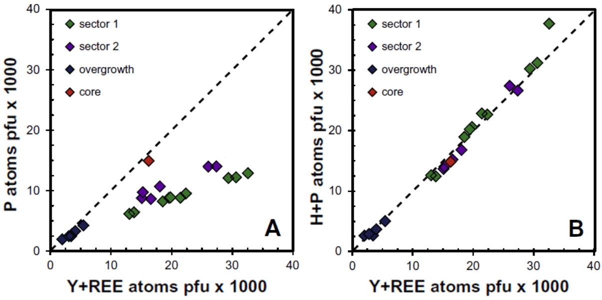

**Figure 1:** (**A**) P vs Y+REE (**B**) H+P vs Y+REE

[1] De Hoog *et al*. (2014) *Geoch Cosmoch Acta* **141**, 472-486. [2] Lissenberg *et al*. (2009*) Science* **323**, 1048-1050. [3] Trail et al. (2012) *Geoch Cosmoch Acta* **97**, 70-87.