



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

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

### Citation for published version:

De Hoog, C-J 2015, 'Water contents of natural zircons are controlled by their Y+REE contents', 25th Annual Goldschmidt Conference 2015, Prague, Czech Republic, 16/08/15 - 21/08/15.

### Link:

[Link to publication record in Edinburgh Research Explorer](#)

### Document Version:

Peer reviewed version

### General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

### Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



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

J.C.M. DE HOOG<sup>1\*</sup>, C.J. LISSEBERG<sup>2</sup>,  
R.A. BROOKER<sup>3</sup>, R.W. HINTON<sup>1</sup>, D. TRAIL<sup>4</sup>,  
E.W.G. HELLEBRAND<sup>5</sup>

<sup>1</sup>School of GeoSciences, Univ. Edinburgh, EH9 3FE, UK

(\*correspondence: ceesjan.dehoog@ed.ac.uk)

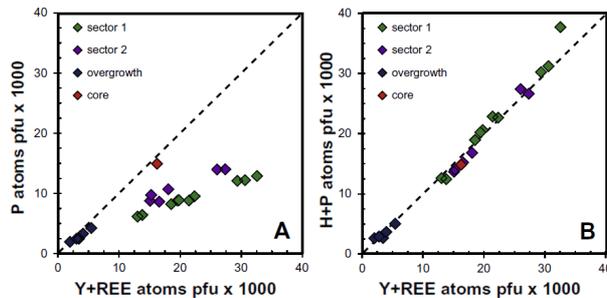
<sup>2</sup>School of Earth and Ocean Sciences, Cardiff Univ., UK

<sup>3</sup>School of Earth Sciences, Univ. Bristol, UK

<sup>4</sup>Dept. Earth and Envir. Sciences, Univ. Rochester, USA

<sup>5</sup>Dept. of Geol. and Geoph., Univ. Hawai'i at Mānoa, USA

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<sub>2</sub>O, 1.4 wt% Y<sub>2</sub>O<sub>3</sub> and 0.6 wt% P<sub>2</sub>O<sub>5</sub> 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<sup>-1</sup> 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<sup>4+</sup> partitioning is not affected, Ce anomalies may depend on H<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub> 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.