Looking for the keys under the lamppost: Trace elements in fibrous diamonds

Y. WEISS[1]*, W.L. GRIFFIN[2] AND O. NAVON[1]

[1]The Fredy and Nadine Herrmann Institute of Earth Sciences, the Hebrew University of Jerusalem, Israel (*correspondence: yakov.weiss@mail.huji.ac.il, oded.navon@huji.ac.il)

[2]GEMOC, Macquarie University, NSW, Australia (wgriffin@els.mq.edu.au)

Early analyses of trace elements in diamonds used destructive techniques. Recently, LA-ICP-MS has emerged as a new, less destructive tool for *in situ* analysis or for 'off-line' ablation. Much effort is being invested in bringing the detection limit of this method to a level that will allow the analysis of a wider range of elements in gem material.

Here we report a study of fibrous diamonds that carry up to 1 wt% of submicron fluid inclusions. Combining EPMA, FTIR and LA-ICP-MS data the full composition of the trapped fluids is now available. Fluid composition varies between hydrous-saline, hydrous-silicic and two carbonatitic endmembers (high-Mg and low-Mg ones).

Calculation of the trace element contents of the fluids reveals high enrichment of the 'incompatible' elements even in comparison with kimberlitic melts (up to a few thousand PM values). We distinguish two common patterns between Cs and La: 'Tables' are rich in Ba, Th, U and LREE and depleted in alkalis, Nb and Ta, 'Benches' are smoother and devoid of significant anomalies. The two can be best distinguished by their U/Rb and La/Nb ratios.

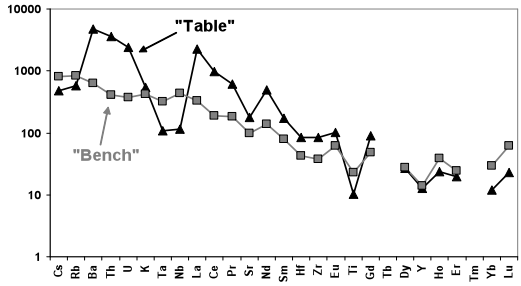

Figure 1: 'Table' and 'Bench' patterns in silicic HDFs.

A closer examination reveals unique features in patterns of diamond from some localities. For example, 'Table' patterns in saline fluids from the Diavik mine exhibit higher Ba/Th ratios and steeper REEs compared with similar fluids from Koingnaas. Some analyses of gem diamonds reveal patterns that are close to the 'Table' and 'Bench' ones. Such unique provenance-controlled features in fibrous diamonds may prove useful in defining the source of gemmy diamonds.

Seasonal variation in the Mg/Ca ratio and $\delta^{18}O$ of the planktonic foraminifera, *Globigerina bulloides*: Results from the Gulf of Tehuantepec, Eastern Equatorial North Pacific

K.E. WEJNERT[1]*, R.C. THUNELL[1,2], E, TAPPA[2], M. MACHAIN[3], M.L. MACHAIN-CASTILLO[3], F.R.G. ARGÁEZ[3], X.A. NAVA[3] AND G. GONZÁLEZ-CHAVEZ[3]

[1]Marine Science Program, University of South Carolina, Columbia, SC 29208, USA (*correspondence: kwejnert@geol.sc.edu)

[2]Department of Earth and Ocean Sciences, University of South Carolina, Columbia, SC 29208, USA

[3]Instituto de Ciencias del Mar y Limnologia, Universidad Nacional Autonoma de Mexico, Coyoacan Mexico, DF, MEX 04510

Mg/Ca and $\delta^{18}O$ has been measured in the surface dwelling planktonic foraminiferal species *Globigerina bulloides* from weekly sediment trap samples collected from two depths (460 and 560m) in the Gulf of Tehuantepec (15°38.826 N, 95°16.905 W) between February 2006 and June 2008. The Gulf of Tehuantepec is a region of intense upwelling and undergoes significant seasonal changes in sea surface temperature (SST) (~ 24° – 31°C) and salinity (~ 33.3 – 34.5). Our results show that Mg/Ca and $\delta^{18}O$ are negatively correlated (r^2 = - 0.34, $p < 0.001$) with most of the scatter occurring in the region of low Mg/Ca and high $\delta^{18}O$ values. A comparison of the Mg/Ca values with weekly sea surface temperature measurements yields a weak positive correlation (r^2 = 0.23, $p < 0.001$), while no significant correlation exists between the $\delta^{18}O$ and SST. We attribute the latter to seasonal changes in the depth habitat of *G. bulloides*. Temperatures calculated from the Mg/Ca data range from 21° – 32°C and thus agree fairly well with the measured temperatures. Temperatures calculated from $\delta^{18}O$ are generally similar to those estimated from Mg/Ca.