Fine step release of helium, argon, and carbon dioxide from a MORB glass by vacuum crushing and the potential of relocatable noble gas mass spectrometer for preliminary analysis for noble gas research

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A detailed gas release record at each step of crushing in vacuo was determined for a MORB glass using a small and robust instrument consisting of a quadrapole residual gas analyser (RGA) and sample preparation. The sample measured was the most gas-rich obtained from 14[deg]S East Pacific Rise in YK04-07 Cruise, July - August, 2004.

Almost similarly decreasing trends were observed for mass values of 4, 40, and 44 despite variations at each crushing step (see Figure 1). An inverse proportional relationship was observed between mass 4 / mass 40 and mass 40, which has been previously reported for submarine glasses and interpreted as the result of fractionation of ^{4}He from ^{40}Ar caused by differences in solubility during degassing of the magma. Our results are thus consistent with the measured values representing the amounts of ^{4}He, ^{40}Ar, and $^{12}C^{16}O_2$ released from the sample, free from interference from blanks, decay derivatives of CO_2 and hydrocarbons in the ion source.

The results suggest that the analysis by modern RGA can be an effective tool for preliminary analysis of noble gases. The instrument used here is small and portable. Such instruments are so robust that they operate without tuning after relocation thus are ideal for work at near site environments e.g. on research vessels. Continuing advances in mass spectrometry add models with increasingly high mass resolution into RGA product lines, suggesting possible future application of such portable analysers to isotope analysis.

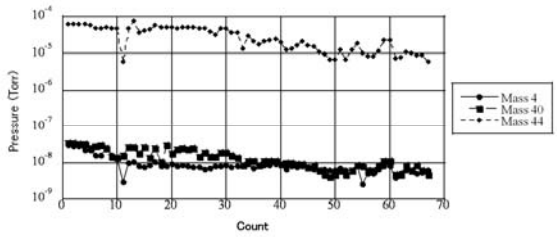

Figure 1