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英文：Magmatic composition in the early stage of Loihi, Hawaiian hot spot

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共同研究者名	所属・職名	備考

８．研究実績報告（成果）（別紙にて約 1,000 字 A4 版（縦長）横書）（別紙に作成）
別紙参照

１０・成果公表の方法（投稿予定の論文タイトル、雑誌名、学会講演、談話会、広報等）

学会講演：

Kudo Y, Matsumoto T, Matsuda JI, Orihashi Y . (2004) Isotope systematics of argon and xenon in the mantle: Inferences from a four-isotope diagram GEOCHIMICA ET COSMOCHIMICA ACTA 68 (11): A284

投稿予定：

Orihashi, Y., Danhara, T., Hirata, T., Iwano, T., Yoshida, H. and Matsumoto, T. (in prep.) Zircon crystals derived from Recent Loihi basalts: Evidence for oceanic lithosphere growth.

Isotopic compositions of heavier noble gases (Ar, Kr and Xe) observed in mantle-derived materials are often indistinguishable from an atmospheric component of which origin is in many cases uncertain. This is the major source of difficulty in assessing the elemental and isotopic compositions of heavier noble gases in the mantle (especially the less-degassed portion of the mantle). In order to clarify the origin of this isotopically air-like component, we have plotted the isotopic compositions of Ar and Xe of a new dataset taken from recently collected Loihi basalts [1] as well as previously published data from the popping rock [2], Loihi dunites and Icelandic glasses [3] in a four isotope diagram (i.e., $^{136}Xe/^{130}Xe$ vs. $^{129}Xe/^{130}Xe$ vs. $^{40}Ar/^{130}Xe$ ratios). Thoes isotope ratios measured by multistep crushing from a single specimen yielded clear mixing trends all extending from the isotopically air-like composition to their respective mantle endmembers. However, from the four-isotope (3D) diamgram, it is clear that the Ar/Xe ratio of the isotopic air-like component is not atmospheric, but is more like that expected for the deep-seawater. The Xe/Ar ratio of contaminant had been fractionated to become higher than atmospheric Xe/Ar ratio. This leads to the conclusion that the Loihi samples with excess ^{129}Xe and ^{136}Ar and relatively low $^{40}Ar/^{36}Ar$ ratios (<500) [1] require a mantle source to have a Xe/Ar ratio of about 30 to 60 times the atmospheric to explain the distribution of the data in a $^{40}Ar/^{36}Ar$ vs $^{129}Xe/^{130}Xe$ diagram by binary mixing between the mantle and air-like components. Because it is highly unlikely that such a high Xe/Ar ratios can be achieved by elemental fractionation during the magma genesis, we suspect the presence of a mantle domain in the less-degassed part of the mantle supplying the Loihi magma being significantly enriched in Xe with respect to Ar.

References

[1] T. Matsumoto, Y. Kudo, J. Matsuda, K. Yamamoto and Y. Orihashi. (2003) *GCA* **67**, A280.

[2] M. Moreira, K. Kunz, C. Allegre, (1998), *Science* **279**, 1178-1181.

[3] M. Trieloff, J. Kunz, D. A. Clague, D. Harrison, and C. J. Allegre (2000) *Science* **288**, 1036-1038.