

# Rare earth element geochemistry of carbonaceous black chert of 3.4 Ga Strelley Pool Chert at Mt. Goldsworthy and Mt. Grant, Pilbara Craton: implications for environment of deposition and habitat of microbes on early Earth

K. SUGITANI<sup>1</sup>, K. MIMURA<sup>1</sup>, A. ALLWOOD<sup>2</sup>

AND K. YAMAMOTO<sup>1</sup>

<sup>1</sup>Graduate School of Environmental Studies, Nagoya University, Nagoya 464-8601, Japan;  
sugi@info.human.nagoya-u.ac.jp

<sup>2</sup>Australian Centre for Astrobiology, Macquarie University, Sydney, NSW2109, Australia; aallwood@els.mq.edu.au

Morphologically diverse, possibly to highly probable biogenic microstructures (thread-like, film-like, spherical and lenticular to spindle-like structures) were newly discovered in black chert of the c. 3.4 Ga Strelley Pool Chert at Mt. Goldsworthy and Mt. Grant in the northeastern Pilbara Craton [1]. Their carbonaceous composition, narrow size distribution, inferred physical properties (flexible but breakable), colony-like occurrence, hollow interiors and resemblance to modern bacteria imply their biogenicity. The host black chert was thought deposited in a shallow to sub-aerial environment at a continental margin, implying the early development of microbial communities in the shallow euphotic zone [2].

In order to give further constraints on the environment of habitat of the microbes, we analysed rare-earth elements of the host black chert samples (n=8) from Mt. Goldsworthy and Mt. Grant. The shale-normalized REE-patterns of most samples (n=7 from 8) are weakly to moderately enriched in HREE ( $Nd/Yb_{SN}=0.26-0.66$ ). These samples also have Y/Ho ratios slightly higher than chondritic value ( $Y/Ho=26.4-36.9$ ), weak to moderate positive Eu-anomaly ( $Eu/Eu^*_{SN}=1.91-6.31$ ). The REE patterns can be basically explained by mixing of seawater and hydrothermal solutions. Archaean microbial communities now preserved as a fossil assemblage in the c. 3.4 Ga Strelley Pool Chert may have consisted of microorganisms that utilized chemical components in hydrothermal solution as energy and/or nutrient sources (chemoautotrophs), in addition to photoautotrophs.

## References

- [1] Sugitani, K., Nagaoka, T., Mimura, K., Grey, K., Van Kranendonk, M.J., Minami, M., Marshall, C.P., Allwood, A., and Walter, M.R. (2006) *EGU2006 Geophys. Abst.*, **8**, 02562.
- [2] Sugitani, K., Mimura, K., Suzuki, K., Nagamine, K. and Sugisaki, R. (2003) *Precambrian Res.*, **120**, 55-79.