Hf-W and I-Xe Ages and the Planetary Formation Timescale

QINGZHU YIN[1] AND M. OZIMA[2]

[1]Department of Earth and Planetary Sciences, Harvard University, 20 Oxford Street, Cambridge, MA 02138, USA yin@fas.harvard.edu.
[2]Graduate School of Earth and Planetary Science, University of Tokyo, Tokyo 113-0033, Japan. EZZ03651@nifty.ne.jp

The $^{129}I(T_{1/2}=15.7Ma)$-$^{129}Xe^*$ age for Earth is commonly estimated at ~100 Ma (Wetherill, 1975), consistent with the timescale derived by Monte Carlo simulation of planet formation (Wetherill, 1990). However, armed with modern computing power, the N-body simulations with actual orbital integration all seem to be finding timescales in the 10 to 50 Ma ranges for forming terrestrial sized planets, experiencing their largest impact at an average time of 29 Ma (Agnor et al., 1999). New Hf-W results constrain the planet formation processes be completed by 30 Ma, and Moon-forming giant impact is dated at 29.5±1.5 Ma with a fully-grown Earth (Yin et al., 2002). Significant additional accretion after 30 Ma will erase the observed W isotopic signature for the Bulk Silicate Earth.

In this contribution we re-examine the issues surrounding the I-Xe age estimate for the Earth, $\Delta T=1/\lambda_{129}*\ln[(^{129}I/^{127}I)_0/(^{129}I/^{127}I)_E]$, where subscript "0" refers to solar initial value of $1x10^{-4}$ and subscript "E" to the ratio at the time of "formation of the Earth"

The value of $(^{129}I/^{127}I)_E=10^{-6}$ given by Wetherill (1975), crucially depends on the estimation of the stable monoisotopic ^{127}I=I content in the present Earth (practically in the Crust). Wetherill (1975) assumed I = 0.5 ppm in the crust. Deruelle et al (1992) got I = 1.5 ppm, but more recently Muramatsu and Wedepohl (1998) gave I = 0.3 ppm. The difference in these estimates mainly resulted from different estimates of the thickness of the oceanic sediment layer that is the major reservoir of I in the Earth. Only the latest paper (Muramatsu and Wedepohl, 1998) considered the results of recent Deep-Sea Drilling Project, therefore likely providing the better representative value.

Ozima and Podosek (1999) showed that the correction for missing Xe (about 90%) reduced the difference in the initial $^{129}I/^{127}I$ ratio or the age gap in the formation interval between the Earth and meteorites by about a factor of 2.

Collectively these effects reduce the ΔT from about 100 Ma (Wetherill, 1975) to about 30 Ma. In summary, both Hf-W and I-Xe systematics strongly suggest quicker timescale for planetary evolution than hitherto considered. We also discuss further implications of this result.

Tryptophan and other amino acids in the sediments of four Chinese lakes

Z. Y YIN[1], Y. R. CAI[1], F. WU[1] AND E. TANOUE[2]

[1]State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, CAS, Guiyang, 550002, PR China (yzy@ms.gyig.ac.cn ; fcwu@hotmail.com)
[2]Division of Earth and Environmental Sciences, Graduate School of Environmental Studies, Nagoya University, Nagoya, 464-8601, Japan (tanoue@ihas.nagoya-u.ac.jp)

HPLC coupled with alkaline hydrolysis was developed to determine tryptophan concentrations in sediments (Wu and Tanoue, 2002), and geochemical processse of tryptophan and other acid hydrolyzable amino acids during early diagensis were discussed. The results show that tryptophan concentrations ranged from 0.15 to 2.66 μmol g^{-1}, and accounted for 0.17 - 9.18% of total hydrolyzable amino acids (THAA) in the surface sediments of four Chinese lakes (Lake Baihua, Lake Hongfeng, Lake Aha and Lake Erhai), suggesting that tryptophan was a minor component. The relative abundance of tryptophan increased with the sediment depth, and that of tyrosine and phenylalanine decreased, indicating the contrasting behaviors among aromatic species. The good positive relationship between tryptophan and serine suggests that tryptophan was related to the selective diatom cell wall preservation in sediments.

As an essential amino acid, tryptophan is likely not synthesized from many other amino acids in heterotrophic metabolism due to its long chain, therefore has an important nutritional value to aquatic organisms. At present, little is known regarding to the biogeochemical cycling of tryptophan in sediments (Wu and Tanoue, 2001a b). Our results are of significance to further investigations in the source, fate and biogeochemical role of tryptophan in aquatic environments.

References

Wu, F.C. and Tanoue, E., (2002). *Chem. Geol.* **184**, 139-149.
Wu, F.C. and Tanoue, E. (2001a). *Org. Geochem.* **32**, 1311-1318.
Wu, F.C. and Tanoue, E. (2001b). *Environ. Sci. and Technol.* **35**, 3646-3652.