Hf-W chronometry of chondrites

H. PALME[1], T. KLEINE[2], J. ZIPFEL[3], T. SCHÖNBECK[1] AND M. GELLISSEN[1].

[1]Institut für Mineralogie und Geochemie, Universität zu Köln, Zülpicherstr. 49b, 50674 Köln, Germany (herbert.palme@uni-koeln.de)
[2]Institute for Isotope Geochemistry and Mineral Resources, ETH Zürich, Clausiusstrasse 25, 8092 Zürich, Switzerland
[3]Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, D-60325 Frankfurt am Main, Germany.

The total Fe content of chondritic meteorites is variable, reflecting separation of metallic iron in the early solar system. Such metal-silicate fractionations should be accompanied by fractionations of Hf from W and, hence, their timing can be studied using ^{182}Hf-^{182}W chronometry. Here we present Hf-W and bulk chemical data of large, homogenized samples for various groups of chondrites with the ultimate goal to date the metal-silicate fractionation in the early solar nebula. Both, Hf/W and ^{182}W/^{184}W ratios increase in the order of H-L-LL chondrites, as expected from the abundance of metal in these chondrites. However, there are substantial variations in the Hf/W ratios within the H and LL chondrite groups, which may indicate W mobility during parent body processes. These currently hamper precise dating of the Hf-W fractionation among the chondrites. All LL chondrites studied here (including type 3) plot below the CAI isochron [1], suggesting that the Hf-W fractionation, i.e., metal silicate separation post-dated formation of CAIs by a few Myrs. More data, particularly for the most primitive chondrites are needed to confirm this observation. An important aspect of our new data is that H chondrites, on average, have lower Hf/W ratios than carbonaceous chondrites, whereas L chondrites have Hf/W ratios indistinguishable from carbonaceous chondrites [2,3]. This is unexpected given the fact that H chondrites have Fe/Mg ratios similar to those of CI chondrites, but L chondrites have lower Fe/Mg ratios. This and the relatively low W contents in metals from type 3 ordinary chondrites [4,5] could indicate that a significant part of the W did not condense as metal. If this is true, conditions in the chondrite formation region must have been rather oxidizing.

References

[1] Kleine T. *et al*. (2005), *GCA* **69**: 5805-5818.
[2] Kleine T. *et al*. (2002), *Nature* **418**: 952-955.
[3] Kleine T. *et al*. (2004), *GCA* **68**: 2935-2946.
[4] Rambaldi E.R. (1976), *EPSL* **31**: 224-238.
[5] Kong P. and Ebihara M. (1996), *EPSL* **137**: 83-93.

Lead origin and fate in soils: Geochemical records in buried soils over the past 3500 years

T. PAMPURA[1], V. DEMKIN[1] AND A. PROBST[2]

[1]Institute of Physicochemical and Biological Problems in Soil Science RAS, Russian Federation, (pampura@mail.ru)
[2]Laboratoire d'Ecologie Fonctionnelle (ECOLAB), ENSAT/CNRS, France (anne.probst@ensat.fr)

Methods

The effect of climate fluctuations and anthropogenic impact on lead origin and fate in Chestnut soils (Low Volga region, Russia) over the past three and a half millennia has been investigated. We compared the morphology, organic matter, soluble soil, gypsum, carbonates, total lead content and Pb isotope ratios in the profiles of modern soils and soils buried under the burial mounds, dated using archaeological methods. Buried soils form a chronological sequence from XVI-XV centuries BC till nowadays.

Results and discussion

Comparison of buried soils and their modern analogues demonstrated that during the past 3500 years the cyclic reversible changes of climate took place in this region. Drought epoch had started 4500 years ago with maximum between 2000 BC and 3000 BC. The most moist climate conditions were found in XII-XIV cent.

We observed an increase of total lead concentration in upper soil horizon along soil chronological sequence probably reflecting a growing anthropogenic input of lead. However the difference in total lead content and isotope ratios between modern and buried soils is statistically significant only for soils buried before the middle ages. Lead isotope ratios in upper horizons of modern soils (^{207}Pb/^{206}Pb and ^{208}Pb/^{206}Pb) fit to European Standard Pollution Line and Russian-GDR gasoline line (Haack *et al*., 2003), reflecting the influence of airborne Pb, deposited from a continent-wide mixing system or local sources of Pb-gasoline.

Financial support was provided by the Russian Foundation of Basic Research (grant 06-05-65307a).