Organic Contaminants in Lakes: Atmospheric Exchange and Linkage to the Trophic Status of Lakes

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Air-water exchange fluxes of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) have been determined in small lakes (ELA, Canada), the Great Lakes (Green Bay; Lake Michigan; Lake Superior) and in the estuaries of the Mid-Atlantic States (NY-NJ Harbor Estuary; Chesapeake Bay). In systems previously contaminated by PCBs, volatilization fluxes are large and play a dominant role in aquatic losses and as sources to the regional atmosphere. Other aquatic systems near urban-industrial centers experience enhanced deposition (absorptive fluxes) resulting from elevated concentrations in urban plumes. The controls and importance of air-water exchange of PCBs and PAHs in system mass balances and inventories, and in direct contamination of aquatic food webs will be discussed with examples from these well-studied systems. Air-water exchange of organic contaminants is an important if not dominant contributor to contamination of phytoplankton, the base of the aquatic food web, and thus is closely linked to carbon cycling and trophic status. In addition, improved physical-chemical properties of organic compounds and modeling frameworks permit the re-evaluation of organic chemical fluxes first determined 5 to 15 years ago, and their relative importance to total loads.

Various graphite morphologies with a diversity of C- and N-isotopic signatures in the highly equilibrated Acapulco meteorite

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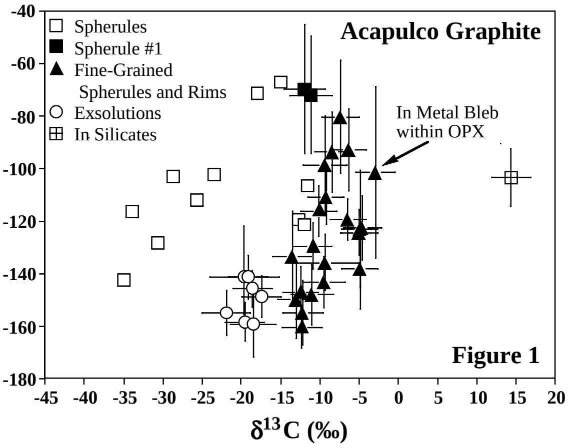
Introduction

Acapulco is a highly equilibrated meteorite and a member of the acapulcoite-lodranite clan with strong chemical affinities to H-chondrites [1]. It has experienced partial melting and pervasive re-crystallization [1], a process expected to erase primordial N-isotopic signatures.

In a detailed petrographic-isotopic study of graphite in this meteorite we encountered eight different graphite morphologies, either in close vicinity or inter-grown with each other. These include spherulitic, feathery, fibrous bands, round fine-grained inclusions, exsolution veneers between kamacite and taenite, and single crystals in the silicate matrix. The C- and N-isotopic ratios (δ^{13}C versus δ^{15}N) are plotted in Figure 1. Spherulitic graphite plots along a linear array with a slope of 3.25. Graphite exsolution veneers at the kamacite-taenite interface has the lightest C- and N-isotopic compositions (δ^{13}C = –23 → –18 ‰, δ^{15}N = –159 → –141 ‰). Fibrous graphite band around spherulitic graphite has much lighter N than the spherulitic core (δ^{15}N = –145 ‰ versus δ^{15}N = –71 ‰). A single crystal in the silicate matrix has an C-isotopic ratio completely different from all other graphite grains in Acapulco (Figure 1).



The results indicate that the individual graphite morphologies retained their pristine isotopic signatures, despite the pervasive equilibration and partial melting experienced at T = 1200º C by the Acapulco parent body [1].

References

[1] Zipfel J. et al., (1995), *GCA*, **59**, 3607-3627.