

Carbon isotopic composition of fatty acids in the marine aerosols from the western North Pacific: Implication for the source and atmospheric transport

JIASONG FANG¹, KIMITAKA KAWAMURA², YUTAKA ISHIMURA², AND KOUHEI MATSUMOTO²

¹Department of Geological and Atmospheric Sciences, Iowa State University Ames, IA 50011-3212, USA

²Institute of Low Temperature Science, Hokkaido University, Sapporo, Japan

Abstract – A combined molecular and isotopic approach was used in this study to reveal the source and transport of aerosols at a remote oceanic site. Fatty acid distributions and stable carbon isotopic compositions of individual fatty acids were determined in the aerosol samples collected at Chichijima in the western North Pacific over a period of forty-one months. Fatty acid concentration and isotopic composition $\delta^{13}\text{C}$ (vs. PDB) exhibited temporal variations. Concentrations of fatty acids (C_{12} to C_{34}) ranged from 7.6 to 20.7 ng/m³. The concentrations of lower molecular weight (LMW) fatty acids (C_{12} - C_{19}) tend to decrease in winter and increase in summer, whereas the higher molecular weight (HMW) C_{20-34} fatty acids exhibited a reversed trend. Compound specific isotopic analysis revealed that the LMW fatty acids exhibited consistently less negative $\delta^{13}\text{C}$ values than the HMW fatty acids. However, both the LMW and HMW fatty acids displayed similar trend of temporal variations in $\delta^{13}\text{C}$, suggesting that the fatty acids experienced similar atmospheric pathways and transport processes to the remote marine atmosphere, whereas the difference in absolute $\delta^{13}\text{C}$ reflects the different sources of the fatty acids.

Modelling the sorption of metal cations on metal hydroxides: experiment vs. model.

FRANÇOIS FARGES^{1,2}, MARCO BENEDETTI³,

INGRID BERRODIER¹ AND GORDON E. BROWN JR.²

¹Laboratoire des Géomatériaux, Université de Marne la Vallée, France (farges@univ-mlv.fr)

²Department of Geological & Environmental Sciences, Stanford University, Stanford, CA 94305-2115 USA (gordon@pangea.stanford.edu)

³CNRS-ESA 7047, Université de Paris 6, Paris, France.

Modelling of the local structure around metal cations in Earth materials of environmental importance is based on thorough analyses of available spectroscopic and scattering information for these samples. However, construction of atomistic models of metal ion sorption on mineral surfaces from experimental data is not straightforward. In order to refine our understanding of sorption processes, we have developed a procedure for refining EXAFS spectroscopic data based on wavelets and Monte-Carlo modelling of the local structure around the sorbate ion. Then, electrostatic potential and bond valence considerations are used to validate and constraint the model. Finally, this model is compared with predictions from the CD-MUSIC model and with macroscopic information obtained from potentiometric titrations.

To illustrate this approach, the sorption of gold on the surface of goethite will be examined (based on the EXAFS data of Berrodier et al., 1999). Medium-range inter-polyhedral relationships were obtained from a wavelet analysis of the EXAFS spectra, which excludes spurious artefacts such as multi-electronic transitions and multiple-scattering features, and provides a correct estimate of the k -range needed to derive robust structural information from the EXAFS spectra. Then, bond valence models were constructed in 3-D and refined using Monte-Carlo-type methods to match the experimental results. Several unique models were tested by calculating effective charges on each atom using self-consistent potentials (which also include protons) with the FEF8 code (Ankudinov et al., 1998). These bond-valence models were then refined using the CD-MUSIC package (Hiemstra and van Riemsdijk, 1996), which predicts the speciation of gold at the goethite/solution interface (110 and 021 faces). The results of this approach are in excellent agreement with potentiometric titrations up to pH 12.

Ankudinov, A.L., Ravel, B., Rehr, J.J., and Conradson, S.D. (1998) *Phys. Rev. B* 58, 7565-7576.

Berrodier, I., Farges, F., Benedetti M., and Brown, G.E., Jr. (1999) *J. Synchrotron Rad.* **S6**, 651-652.

Hiemstra, T. and van Riemsdijk, W. (1996) *J. Colloid Interface Sci* **179**, 488-508.