

A snowpit record of atmospheric Fe deposition in West Antarctica at the WAIS Divide site

BESS G. KOFFMAN^{1*}, KARL KREUTZ¹, MIKE HANDLEY¹,
MARK WELLS² ANDREI KURBATOV¹ AND
PAUL MAYEWSKI¹

¹Climate Change Institute, University of Maine, 303 Bryant
Global Sciences Center, Orono, ME 04469

(*correspondence: bess.koffman@umit.maine.edu)

²School of Marine Sciences, University of Maine, Orono, ME
04469

The West Antarctic Ice Sheet Divide Deep Ice Core (WDC) is being drilled in a high-accumulation area (79.468° S, 112.086° W) that should yield a 100,000-year record with annual resolution to 40,000 years. In late 2005 a 3 m snow pit was dug at the site of the present borehole, resulting in 63 samples at 5 cm resolution. We here present the results of ICP-MS analysis of these snow pit samples, including the four different Fe fractions (particulate Fe, dissolved Fe, biologically available Fe and total Fe), which represent the first Fe data recovered from the WDC site. Based on annual variability of S concentrations, the samples cover nearly 6 years of accumulation (total water equivalent accumulation of ~125 cm for 1999-2005), consistent with the average water equivalent accumulation at the site of ~24 cm/a. Average Fe concentrations in the total fraction of 1.836 µg/L and in the biologically available fraction of 0.586 µg/L give a geometric mean solubility of 35%, comparable to the 32% geometric mean solubility seen at other Antarctic sites. Based on results from the remaining two Fe extractions at WDC and a comprehensive comparison with all available snow/ice Fe data in Antarctica, we will discuss possible reasons for observed Fe spatial and chemical variability.

The crystal structure of a new Ca-Na-Mn³⁺-arsenate from a small metamorphic Mn deposit in Italy

UWE KOLITSCH

Mineralogisch-Petrographische Abt., Naturhistorisches
Museum, A-1010 Wien, Austria
(uwe.kolitsch@nhm-wien.ac.at)

In Northern Italy several metamorphic Mn deposits show assemblages of rare and unusual Mn arsenates, vanadates and silicates. In the Montaldo mine, Borgata Oberti, Cuneo Province, Piedmont, from which the rare Ca-Na-Mg-arsenate garnet berzeliite was recently described [1], a new Ca-Na-Mn³⁺-arsenate was found and its crystal structure was determined. Acid-treating of calcite in the quartz matrix of a single specimen had revealed a blackish (very dark red translucent) blocky grain, ~0.15 mm in size and accompanied by hematite, hollandite/cryptomelane, a greyish diopside-augitic clinopyroxene and a Mn-bearing reddish mica.

The crystal structure of the new mineral was solved from single-crystal X-ray diffraction data (RT, MoK α); $R(F) = 1.95\%$. The phase is orthorhombic, with space group $Pbcm$ and $a = 8.885(2)$, $b = 7.535(2)$, $c = 11.707(2)$ Å, $V = 783.8(3)$ Å³, $Z = 4$. The asymmetric unit contains two Ca/Na, one Mn, two As and seven O sites; one of the latter appears to be partially protonated. The mineral has a framework structure based on a dimer composed of two *trans* edge-sharing, Jahn-Teller distorted Mn³⁺O₆ octahedra (Mn-O range: 1.8082(7) - 2.1741(11) Å) that are corner-linked to AsO₄ tetrahedra and adjacent dimers. One AsO₄ tetrahedron shares all its corners with dimers, while the other exhibits a 'free' corner, the O atom on which is undersaturated (1.64 v.u.) and loosely bonded (distinctly elongated displacement ellipsoid). Two [7]-coordinated Ca/Na sites occupy voids in the framework. The following chemical formula has been derived on the basis of occupancy refinements, bond-valence calculations and crystal-chemical considerations: (Ca_{0.84}Na_{0.16})(Ca_{0.46}Na_{0.54})Mn₂O(O,OH)(AsO₄)₂. The (O,OH) site, bonded to two Mn atoms, has a bond-valence sum of 1.52 v.u.; the Ca-rich and -poor sites have sums of 1.85 and 1.69 v.u., respectively. Since a quantitative chemical analysis has not been done yet, the chemical formula is somewhat preliminary.

It is hoped that the ongoing study of the mineralisation of the Montaldo mine will provide more material enabling a complete characterisation of the new species.

Marco Ciriotti is thanked for submitting the specimen for analysis.

[1] Piccoli *et al.* (2007) *Micro* **2007**, no. 1, 49-54.