

## Single-crystal X-ray diffraction studies on spinels from the San Carlos Volcanic Field, Arizona

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Studying the distribution of elements between coexisting minerals is a common way to determine pressure and temperature conditions of mantle rocks. Using X-ray diffraction techniques and microprobe analysis, one may also obtain information on petrological conditions by examining the relative occupancies of elements between crystallographically distinct sites within a single mineral phase. The goal is to obtain information on the pressure - temperature history of mantle xenoliths from San Carlos Volcanic Field, Arizona, by a complete crystal chemical study of all the phases in a variety of xenoliths. In this study we report the results for a spinel.

Two types of xenoliths, Type I and II, based on major elemental chemistry have been recognized. Type I xenoliths are more Mg-rich and contain Cr-rich clinopyroxene, while Type II xenoliths are more Fe-rich and contain Al-rich augite. Some Type II xenoliths contain plagioclase. Type II xenoliths are more heterogeneous in modal proportions compared to Type I xenoliths. Chemistry and modal analyses of our xenoliths are consistent with the analyses of xenoliths from the same locality by other researchers.

Fourteen spinels from San Carlos Volcanic Field, Arizona, were analyzed using single-crystal X-ray diffraction techniques and microprobe analysis. We analyzed 8 spinel crystals from Type I xenoliths and 6 from Type II. All spinels are essentially  $(Mg,Fe)(Al,Cr)_2O_4$  in composition, with minor amounts of Ni, Ti, Mn. Spinel from Type I xenoliths contain more Cr and Mg, therefore less Al and less Fe compared to spinels from Type II xenoliths. There seems to be 2 populations of spinels from Type II xenoliths, one more enriched in Cr than the other.

The primary focus of this study is on the structural characteristics of these spinels. Spinel from Type I xenoliths display a wider range of chemical and structural parameters than spinels from Type II xenoliths, which are chemically and structurally limited. Unit cell parameters of Type I xenoliths range from 8.1259 - 8.2167 Å., while for Type II xenoliths they range from 8.1247 - 8.1569 Å. The cell parameters are linearly correlated with  $Fe^{2+}$  and Cr contents.

Type I:  $a = 8.047 (20) + 0.114 (14) Cr + 0.283 (93) Fe^{2+}$

Type II:  $a = 8.085 (15) + 0.136 (13) Cr + 0.112 (46) Fe^{2+}$

The San Carlos spinels display a high degree of order with inversion values,  $i$ , mostly ranging from 0.00 to 0.08 ( $\pm 0.02$ ). The correlation between Cr content and degree of inversion in our spinels is not very obvious, but there may be an effect of Cr on degree of inversion. Spinel from type I xenoliths, which contain more Cr, have overall smaller values for inversion parameter ranging from 0.00 to 0.05 than those of spinels from Type II ranging 0.02 to 0.14.

## Compound-specific radiocarbon sedimentary chronology for the high resolution IMAGES core (MD012412) in the Sea of Okhotsk

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It is important to document glacial-interglacial changes in North Pacific because the Pacific Ocean is the end-member of the modern circulation regime and may have been very different during previous climate state. Their detailed knowledge would be able to be provided by investigating high resolution core which have many data sets from centennial to millennial time scales. Many parameters should be compared to find some timings of climate change each other. On the other hand, high resolution core (high sedimentation) could increase detected limits of some parameters preserved in the core, which may increase uncertainty of time axis of each parameter associated with their sedimentation rate. Their difference will be attributed to difference of depositional setting to sediment. Recently some researchers showed the difference of sedimentary ages between alkenones and foraminifera in Bermuda rise (Ohkouchi et al), as well as in hemipelagic cores in western North Pacific (Uchida et al). In the western North Pacific regions, we are also limited to get enough amounts of planktonic foraminifera, especially, in the Holocene, for radiocarbon analysis by AMS due to its dissolution. In order to get insight into the establishment of dating proxy, compound-specific radiocarbon analysis was conducted on IMAGES core in the Sea of Okhotsk with high sedimentation rate of  $\sim 80\text{cm/kyr}$ . We have demonstrated a possibility for dating using biomarker lipids such as fatty acids and alkenones. High sedimentation cores will provide high time-resolution data sets of many paleoceanographic proxies. In order to use such many proxy records, at first we need constraints on sedimentary chronology for different sample types to use such a data set because they should be same time axis each other. In this study, we discussed from both aspects of sedimentary chronology and terrestrial organic matter tracer using compound specific radiocarbon data.