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METAMORPHIC OLIVINE IN PERIDOTITIC KOMATIITE FLOWS, LAC GUYER, QUEBEC: DISCUSSION

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Stamatelopoulou-Seymour & Francis (1980) showed that metamorphic olivine in peridotitic komatiite flows is characterized by an unusually low forsterite content and is less Mg-rich than expected for primary olivine. Metamorphic olivines from many other areas have a high forsterite content and are more Mg-rich than the primary olivine (Arai 1975, Hietanen 1977, Snoke & Calk 1978). No reasonable explanation is given for these results. Perhaps differing redox environments during serpentinization, resulting in different mineral associations parental to metamorphic olivines, can explain the observed compositions.

In most cases, where serpentinization takes place under oxidizing conditions, iron in olivine is oxidized and converted to magnetite. During later prograde metamorphism of serpentinite, olivine is produced from magnesian serpentine, whereas the magnetite remains stable. Consequently, the metamorphic olivine is more magnesian than the original olivine. On the other hand, where serpentinization of olivine takes place in the absence of free oxygen, no magnetite is formed. The following equation, after Shteyberg & Chashukhin (1969), provides a possible explanation: $2(Mg,Fe)_2SiO_4 + 3H_2O \rightarrow Mg_3Si_2O_5(OH)_4 + (Mg,Fe)(OH)_2$. As the temperature rises, olivine appears at the expense of serpentine and brucite. This results in Mg-poor olivines, because high-temperature minerals are always more Mg-poor than associated low-temperature minerals in metamorphic rocks.

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METAMORPHIC OLIVINE IN PERIDOTITIC KOMATIITE FLOWS, LAC GUYER, QUEBEC: REPLY

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We thank Dr. Zhang for what appears to be a reasonable explanation for the high iron in the metamorphic olivines from the Lac Guyer Archean ultramafic flows. In fact, we are familiar with two other cases of metamorphic olivine from Archean ultramafic rocks (Oliver & Ward 1971, Oliver *et al.* 1972, Collerson *et al.* 1976); these also seem to have high iron contents, supporting Dr. Zhang's idea.

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