

## Mn-Cr ages of Fe-rich olivine in two rumuruti chondrites

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Rumuruti chondrites are a small group of meteorites that are highly oxidized and have unique oxygen isotopic compositions. Here I report Mn-Cr ages of Fe-rich olivine grains in two rumuruti chondrites, NWA753 and Sahara 99531. The NWA 753 is assigned to type 3.9. But it is a breccia and the section I examined consists of two lithologies, one (lithology A) is more primitive and less oxidized (containing a lot of metal grains) than the second lithology (lithology B) which seems to be a typical rumuruti chondrite according to the olivine composition. The Sahara 99531 is a typical rumuruti chondrite (type3-5) similar to the lithology B of the NWA 753. An ion probe (Cameca-6f) at the Univ. of Tokyo was used for the Mn-Cr dating. Often, the Fe-rich olivine grains contain tiny speckles of chromite that appear to be produced during the metamorphism. Measurements were made on olivine grains that are devoid of such chromite. The lithology A in NWA753 did not contain any olivine grains with high Mn/Cr ratios because it did not experience much metamorphic heating that causes loss of Cr from olivine grains.

Mn/<sup>52</sup>Cr ratios up to 1500 and 1300 were observed for the NWA 753 and for the Sahara 99531, respectively. <sup>53</sup>Cr isotope anomalies up to 30 permil were observed for the NWA 753 whereas delta<sup>53</sup>Cr values were always normal within the respective errors for the Sahara 99531. The inferred initial <sup>53</sup>Mn/<sup>55</sup>Mn ratio for the NWA 753 is (2.37 +/- 0.67 (2σ))x10<sup>-6</sup>. This translates to an age 3.4Ma. before the angrite LEW 86010 (Lugmair and Shukolyukov,1998). The upper limit to the age for the Sahara 99531 is about 3Ma. after the LEW 86010.

The Mn-Cr ages of rumuruti chondrites probably correspond to the time when olivine became a closed system during cooling from the peak metamorphic temperature that occurred earlier than the final assembly of the brecciated chondrites.

### Reference

Lugmair G.W. and Shukolyukov A. (1998) GCA, 62, 2863-2886.

## Experimental study of loparite formation due to the problem of Lovozerskii massif ores genesis

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Due to the problem of loparite ores genesis a number of loparite-bearing rocks, including ore horizons, of the Lovozerskii alkaline massif have been investigated. Their mineralogenesis temperatures have been estimated by different mineral geothermometers and are ~450-400°C. It could be related to the high contents of fluid components and increased alkalinity at their formation. The compositions of loparites vary (by the content of Sr, REE and Nb) depending on the spatial location in the massif body. In some rocks samples large grains of loparite with "spotty" zoning are discovered. These data allow to conclude about the correlation of the loparite composition with physical-chemical conditions of their formation. The modelling of loparite formation was performed in complicated silicate-salt systems containing carbonate, chloride, fluoride or sulphate of sodium. All the runs were carried out at the hydrothermal high pressure vessel with external heating and cold seal at T=400°C, P=1 kbar during 30 days, T=840°C, P=1.5 kbar during 5-7 days and at the high gas pressure vessel at T=1200°C, P=2 kbar during 1 day or 6 h with subsequent quenching. The charge consisted of eutectic gel mixture of albite and nepheline with addition of Nb, La, Ce, Y oxides, Ca and Sr carbonates and excess of Ti oxide which was placed at the bottom of the capsule, as well as with the addition of corresponding salt or its mixtures and water. At 840°C and 1200°C a formation of loparite crystals located at the boundary of the layers of Ti oxide and silicate melt was observed. The isolated salt phase was also observed, but in sulphate-bearing systems – sulphate-sodalite. In largest loparite crystals a zoning expressing in change of the Nb, La, Ce, Y contents were discovered. It could be connected with kinetic peculiarities of crystallization. Here a loparite compositions are also depended on the salt addition in experiment. For example, at 840°C and 1.5 kbar the largest concentration of Nb in loparite (up to 15 mas.%) was observed in the systems with carbonate-fluoride fluid, but the least one (1.5-2.5 mas.%) – in the systems with carbonate addition. In the former case the distinct zoning of Nb content and low Y content are estimated; but in the latter case more distinct zoning of REE and Y is received. At low temperature (400°C) small grains of loparite were produced in alkaline environment. These data reveals the possibility of loparite crystallization in nature in wide temperature interval.

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