

### **Barred olivine in selected chondrites – insights into nebular formation conditions.**

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Bulk major and trace elements of FeO-poor and FeO-rich barred olivine (BO) chondrules from ordinary, Rumuruti and carbonaceous chondrites we investigated point to cosmochemical instead of geochemical reaction processes in the solar nebula, i.e., gas/liquid or gas/solid condensation [1]. Refractory trace element concentrations indicate predominant formation of FeO-poor followed by Fe-rich chondrules. Progressive removal of refractory phases, such as hibonite, fassaite, and melilite, led to a depletion in highly refractory elements in the chondritic reservoir. From here, FeO-rich BO chondrules were formed and subsequently processed by metasomatic exchange reactions that equilibrated their moderately volatile elements. Chemical variations amongst BO chondrules are only possible upon open system exchange reactions with the cooling vapor in the solar nebula. Local redox variations coupled with overall falling temperatures may have occurred during the evolution of a single but chemically heterogeneous reservoir in which Fe-poor and Fe-rich BO chondrules formed successively.

[1] Varela, M.E. et al. (2025) MAPS 60, 1365–1383.