

Phosphate formation in highly equilibrated chondrites with CR-affinity

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Phosphates are a common secondary phase in equilibrated ordinary chondrites. They are thought to have formed by exsolution of P originally dissolved in metal. During metamorphism, reaction with silicate phases and oxidized P leads to the formation of merrillite. Coexisting apatite formation likely is the result of fluid assisted reactions that deliver halogens such as Cl and F with merrillite [1].

CR related highly equilibrated meteorites NWA 6901 and NWA 3253 and Tafassasset carry abundant merrillite but no apatite. Trace elements in NWA 6901 merrillite exhibit fractionated REE patterns, strongly enriched in LREE. Single grain U-Pb ages are old [2]. The textural evidence for merrillite formation in close contact to metal and olivine supports a reaction relationship under oxidizing conditions. Merrillite enrichment with LREE is locally variable. There is no textural evidence for melt migration. Thus we assume rather percolation of a fluid carrying LREE. The lack of apatite is consistent with a halogen poor environment and general depletion of moderately volatile elements associated with CR chondrites.

References: [1] Lewis, J.A. and Jones, R.H. 2016. *Meteoritics & Planetary Science* 51: 1886-1913 ; [2] Zipfel, J. and Linnemann U. 2012. *EMC 1*: 2012-503.