

Naujakasite revisited

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The rare mineral naujakasite ($\text{Na}_6\text{FeAl}_4\text{Si}_8\text{O}_{25}$) is rock forming in hyperagpaitic lujavrite in the Ilímaussaq complex, Greenland. From a chemographic analysis of naujakasite-bearing mineral assemblages in a much simplified model lujavrite system, Andersen and Sørensen (2005) inferred a very restricted stability field for naujakasite at extreme peralkalinity, low f_{O_2} and moderately elevated a_{H_2} , which is confirmed by modelling in a more realistic multi-component chemical system. The required conditions may not be commonly encountered in alkaline rocks. Agpaitic magma crystallizing eudialyte at an early stage (e.g. kakortokite magma in Ilímaussaq) is unlikely to reach the sodium enrichment needed to stabilize naujakasite by fractional crystallization. An alternative to closed system fractional crystallization to reach the very high sodium activity required by naujakasite is intraplutonic assimilation of sodalite by a lujavrite magma that may allow liquid compositions to tunnel through the eudialyte-arfvedsonite-albite-nepheline and aegirine-arfvedsonite-albite-nepheline barriers to develop further towards hyperagpaitic residuals that will eventually crystallize naujakasite.

Like the fractional crystallization scenario without aegirine suggested by Andersen and Sørensen (2005), this model requires special geological conditions to be able to operate: Late stage lujavrite magma in Ilímaussaq intruded into naujaite roof cumulate with abundant sodalite. Such a special geological setting may help explaining the global rarity of this mineral.

References:

Andersen, T. and Sørensen, H., 2005. Stability of naujakasite in hyperagpaitic melts, and the petrology of naujakasite lujavrite in the Ilímaussaq alkaline complex, South Greenland. *Mineralogical Magazine* 69, 125-136.