Symmetry Anomaly of New Minerals from Four Unique Localities: Khibina, Lovozero, Ilímaussaq, and Mont St.-Hilaire

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The four famous mineral localities—Khibina, Lovozero, Ilímaussaq, and Mont Saint-Hilaire (KLIM)—share many features, most notably the widespread occurrence of hyperagpaitic pegmatites and their hydrothermal equivalents. The extremely high alkalinity of these nepheline syenite derivatives enables most of the chemical elements to be concentrated together, producing an enormous number of minerals—more than 700 species. About 200 of them are new to science. These include 173 minerals with reliably determined crystal systems, and the latter include 122 silicates. The distribution of new KLIM minerals over various crystal systems (in percent) is compared with that of the entire set of minerals with known systems (3534 species, including 911 silicates as of 1995):

	cub	hex	tet	trig	orth	mon	tric	tric/cub
New KLIM minerals	5.2	8.1	5.8	11.0	24.3	31.8	13.9	2.7
All minerals	10.0	8.9	7.6	8.7	22.5	33.1	9.1	0.9
New KLIM silicates	0.8	4.9	6.6	10.7	27.0	34.4	15.6	19.5
All silicates	3.9	9.5	5.3	6.6	20.9	41.6	12.2	3.1

In the mineral world as a whole, cubic species prevail over triclinic ones, whereas the new KLIM minerals show a nearly 3-fold triclinic-over-cubic predominance. A similar anomaly is established for silicates, which are generally more compositionally complex and, hence, of lower symmetry than most of the other minerals. This anomaly is due to a close genetic relationship between the great majority of KLIM minerals and hyperagpaitic pegmatites. These rocks crystallize from alkali- and volatile-supersaturated low-viscosity melts and solutions, which promote long-range ordering in boundary courts of crystals, lower the temperature, and markedly extend the temperature/time range of crystallization, resulting in a predominance of minerals with highly ordered low-symmetry structures.