Lateral Gradation of Chabazite to Herschelite in the San Simon Basin

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Abstract: The first occurrence of herschelite in the United States has been discovered in bedded Tertiary lake deposits in the San Simon basin, 7 miles northeast of Bowie, Arizona. From all analyses reported, the San Simon herschelite ranks as the sodium end member in the herschelite-chabazite series. Its chemical formula is (0.91 Na 2 , 0.05 K 2 , 0.04Ca)O · Al 2 O 3 · 6.4 SiO 2 · 7.6 H 2 O and grades laterally northward to the edge of the basin to an intermediate composition of (0.38Na_2, 0.01K_2, 0.61Ca)O · Al_2O_3 · 6.68SiO_2 · 8.4H_2O. The crystals occur as radiating aggregates and spherulites which range in size from 25 to 50 microns. The mean index of refraction varies from 1.473 for the sodium end member herschelite to 1.481 for the intermediate sodium-calcium chabazite. The X-ray diffraction data of the varieties are similar, but there is a direct correlation of peak shifts with composition.

The chabazites were formed by the alteration of bedded pyroclastics. In the center of the basin, herschelite occurs as thin layers interbedded with thin layers of analcime, erionite, and clinoptilolite, which are underlain by a massive bed up to 2 ft thick of herschelite, erionite, and clinoptilolite. Bentonite underlies the zeolitized beds. Halite, thenardite, and iron oxides occur in amounts up to 10 weight per cent with the herschelite. Northward the beds of analcime and bentonite pinch out and the halite, thenardite, and iron oxide contents decrease in the chabazite layer. Near the edge of the basin, the chabazite bed is 6 – 8 in. thick and is overlain by a massive bed of erionite, chabazite, and clinoptilolite and underlain by a quartz feldspar silt.

Tertiary andesites and Quarternary basalts rim the basin. The silica to alumina ratio of all the zeolites is the same as andesitic glass. The gradation in the exchangeable cations in the chabazite—herschelite series either reflects the solution chemistry during crystallization or is a result of subsequent ion exchange by descending salt solutions.

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