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X-RAY CRYSTALLOGRAPHY AND MINERAL CHEMISTRY OF MICROLITE AND METAMICT CHEVKINITE FROM PEGMATITES OF PARLAPALLE, NELLORE SCHIST BELT, ANDHRA PRADESH

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Abstract

Investigations on X-ray crystallography and mineral chemistry have been carried out on microlite and chevkinite from Nellore Schist Belt (NSB) and the results are presented. The crystallographic parameters of the investigated microlite are: unit cell dimension (a_o) = 10.3537 Å and unit cell volume (V) = 1109.93 Å^3. Microlite contains high Ta_2O_5 (59.37%) and notable amounts of Nb_2O_5 (13.30%), CaO (13.43%), TiO_2 (2.10%) and Fe_2O_3 (2.83%) with high Fe_2O_3/ FeO ratio (~4). It is radioactive (U_3O_8 0.54% and ThO_2 0.37%). Chondrite-normalised rare-earth element (REE) plot of the microlite reveals enrichment of light REE (LREE) over heavy REE (HREE) with pronounced negative Eu-anomaly (Eu/Eu* = 0.11).

The calculated unit cell constants of the (metamict) chevkinite are: a_o = 13.4251 Å, b_o = 5.7232 Å and c_o = 11.0645 Å, with a V of 836.868 Å^3 and beta angle of 100.1354^o. It is characterized by variable and high Fe_2O_3 (7.94-47.00%), FeO (4.13-4.31%), SiO_2 (4.50-22.63%), CaO (5.37-8.56%), Al_2O_3 (4.50-13.36%), TiO_2 (0.55-2.50%), Ta_2O_5 (13.20-15.64%), Nb_2O_5 (2.82-3.17%) and MnO (1.75-5.68%) contents, with notable amounts of Na_2O (0.43-0.69%) and K_2O (0.10-0.13%). It is also radioactive (U_3O_8 0.30-0.35% and ThO_2 0.40-1.12%). Like microlite, chevkinite also reveals a preponderance of LREE (Ó41625-127418 ppm) relative to HREE (Ó1210-2654 ppm).

Very high values of $(La/Lu)_N$ (15.49-720.35), $(La/Yb)_N$ (15.80-935.11) and $Ce/Yb)_N$ (14.15-795.91) ratios in microlite and chevkinite reflect pronounced fractionation of LREE over HREE. Interestingly, appreciable fractionation among HREE is also brought out by the high $(Gd/Lu)_N$ (1.86-57.81) and $(Gd/Yb)_N$ (2.27-75.05) ratios. Available data reveals that the melt from which the investigated Rare Metal and Rare Earth (RMRE)-bearing minerals had formed was fractionated to certain extent. However, due to sporadic nature of such fractionated pegmatite melt, RMRE mineral abundances in pegmatites of the area are limited.

Keywords: Mineralogy. X-ray crystallography. Mineral chemistry. Microlite. Chevkinite. Parlapalli. Nellore Schist Belt. Andhra Pradesh.

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