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The Big Creek Pegmatite area, Carbon County, Wyoming, on the western slope of the Medicine Bow Mountains is known for its niobium-bearing pegmatites hosted in Precambrian gneiss and schist. The local rancher and miner, Ralph Platt, reportedly found, in July 1956, a dense, glassy black, radioactive boulder, about 30 kilograms in weight on the surface of a potassium feldspar-quartz-muscovite pegmatite. After claiming the property as the Uranium King claim, Platt sunk a shaft into the core of the pegmatite and sold the hand-cobbed Nb-U mineral as uranium ore to the U.S. Atomic Energy Commission. Crystals of this mineral from this locality have since been widely sought by collectors and museums worldwide labeled as euxenite, rarely as samarskite, and sometimes also as allanite. Although a qualitative analysis was described by Houston (1961) and referred to the material as euxenite, no further analysis on this or other associated minerals has been documented.

The complex REE-Nb-Ta-Ti oxides represented by the aeschynite, euxenite, and samarskite group minerals are generally rare, yet occur locally abundant in certain NYF (Nb,Y,F) pegmatites. Aeschynite and euxenite group minerals of general formula AB_2O_8 are orthorhombic with well-understood structure and crystal chemistry. In contrast, samarskite, one of the earliest described REE minerals (over 180 years ago) has an uncertain structure, although it has been intensely investigated in terms of chemical composition. Its crystal structure, because of radiation-induced amorphization (i.e. metamictization), was not confirmed until 2019, when non-metamict crystals from the Laacher See, Eifel volcanic region, Germany, allowed for the crystal structure to be resolved for the first time as monoclinic with *P2/c* symmetry (Britvin, 2019). That work defined samarskite as the first example of a cation-ordered niobate with a pseudo-layered framework related to layered double tungstates, of general formula AMB_2O_8 where A = Y, REE, Th, U^{4+},Ca; M = Fe^{3+}, Mn^{2+}; and B = Nb, Ta, Ti, with an end member formula of samarskite-(Y) of $YFe^{3+}Nb_2O_8$.

Within this new framework, provided by this and other recent work on these classes of REE-Nb-Ta-Ti oxides, we reinvestigated the Platt Pegmatite containing large, yet not previously well analyzed, members of these minerals. The dense metamict Nb-U mineral, listed as euxenite, forms from up to decimeter-scale irregular masses to well-defined single blocky crystals with a rectangular shape and a pitched roof termination. They occur either isolated as single crystals, as intergrown clusters, or intergrown irregularly with large crystals of monazite and rarely columbite, within a potassium feldspar, quartz, biotite, and muscovite matrix. The monazite forms the typical reddish crystals with its characteristic cleavage. Columbite also occurs in part as euhedral crystals of characteristic habit. Schorl is rare but present in crystals up to a decimeter in length.

We report on our recent reinvestigation of the pegmatite studying the mineral associations and structural relationships both above ground and in the underground workings. Samples were obtained from the dump, stockpiled material from the Platt family, and *in situ* underground.

Most significantly, we performed a combination of whole rock ICP-OES/MS/XRF analysis of bulk crystals and electron microprobe (EMP) analysis of grain mounts of the dense black minerals previously thought to be euxenite. We show that the mineral is Y, Fe, and Nb dominant, i.e., the species-defining elements of samarskite-(Y) occupying the A, M, and B sites, respectively. Stoichiometry

calculations and applying the statistical approach of Ercit (2005) confirm this assignment as samarskite. Powder X-ray diffraction shows complete metamictization associated with the high U and Th content.

The monazite and columbite based on chemical analysis and X-ray diffraction is monazite-(Ce) and columbite-(Fe), respectively. The microprobe work confirmed the identity of the allanite. EMP analysis on polished sections of all these species shows considerable granularity and local alteration, with spatial heterogeneity in chemical composition, and inclusions of galena, thorite, xenotime, and secondary U-minerals.

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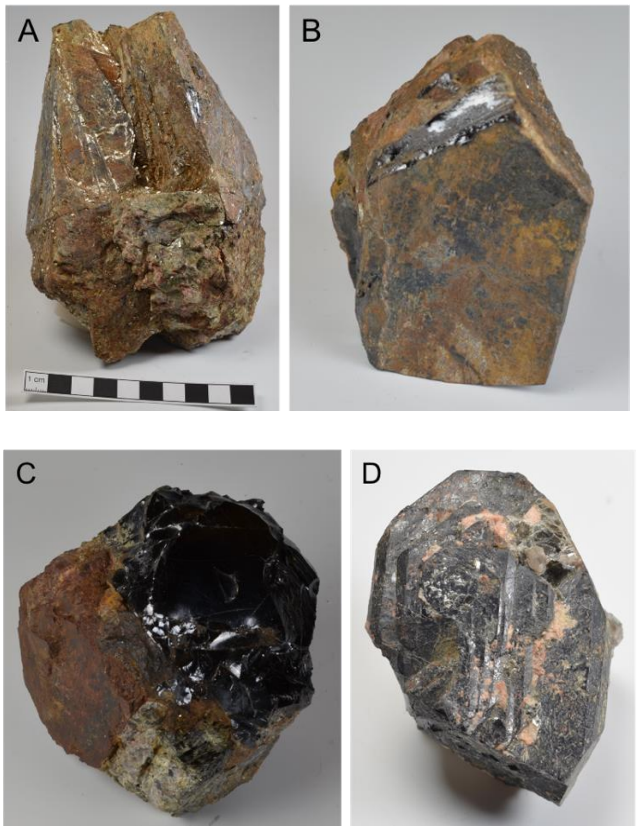

Figure 1. The three REE/rare-element minerals of the Platt Pegmatite: A) large crystal aggregate of samarskite-(Y). B) samarskite-(Y) with typical roof-shaped crystal habit [FOV 5 cm]. C) Intergrowth of samarskite-(Y) (black, right) with monazite-(Ce) (red, left) [FOV 9 cm]. D) Columbite-(Fe) [FOV 5 cm]. Markus Raschke specimens, Mark Jacobson photographs.