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A New Meteor Crater, Old Uranium, Thorium & REE Mineralization, and a New Roll-Front Uranium District … All in Eastern Seward Peninsula, Alaska?

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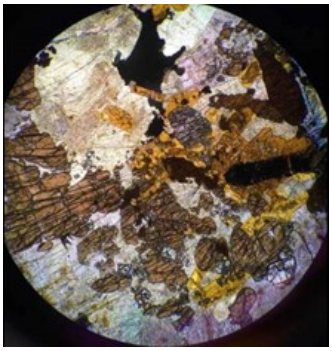
Mineral exploration conducted during 1970s and early 1980s confirmed the existence of heavily mineralized zones containing anomalous uranium, thorium, and rare-earth elements (REE), and other metals in the Kachauik region and in the Death Valley area of the Eastern Seward Peninsula of Alaska. This presentation is based on data from the field work conducted by four of the authors and on more recent data reviewed by the other authors on-going assessment of project data. Substantial analytical investigations and microscopy have been conducted on the metamict mineral allanite and on the available regional geological and geophysical data. Reconnaissance field mapping and sampling, and petrographic, chemical, XRD, microprobe, cathodoluminescence and metallurgical analyses have been conducted and indicate that mineralized zones occur within a composite alkalic intrusive complex related to, but separate from, the Darby pluton. Based on the anomalous uranium content of the intrusive rocks, the plutons are also likely source rocks of uranium leaching into the groundwater system of a closed early Tertiary to recent basin, McCarthy Marsh, (possibly created initially by an impact crater), which is some 30 miles in diameter. The basin is filled by as much as 16,000 feet of fluvial and paludal sedimentary rocks containing lignite. The eastern part of the basin is underlain by a prominent dipole magnetic anomaly with a likely shallow source in the basement rocks below.

The major zone of mineralization examined appears to be related to prominent phonolite dikes that occur along the margin of the Darby pluton in monzonitic country rock. Metasomatic introduction of uranium, thorium, and REE related to dike intrusion is postulated as the principal mechanism of metallogenesis. Areas with associated faulting and favorable host rocks, e.g., contact metamorphosed rock within fractured carbonate and graphitic rocks, as well as other rock types, occur in the immediate area. Of the total uranium contained in the whole-rock allanite-rich samples, approximately 88% is in one or more leachable mineral phases, which averages approximately 0.15% cU_3O_8. Uranium occupies lattice

or inter-lattice positions within hornblende and feldspar and/or can also be present in separate uranium-bearing phases as minute inclusions within essential, varietal, and accessory minerals. As a group, the heavy fraction contains approximately 10 to 15% by weight of the total uranium present in the whole rock.



Based on the analytical work completed to date, uranium appears to be in equilibrium with its radiogenic daughter products. And based on the mineralized samples examined, the rare-earth content consists predominately of the lanthanide group, but with an unusual enrichment in the heavy REE. The distribution of the rare-earth elements is similar to uranium (i.e., the rare-earth elements occur in specific gravity fractions). The rare-earth elements preferentially occur within the allanite subfraction, while uranium is associated with other minerals of low magnetic susceptibility. Strong geochemical anomalies also exist within and around the Kachauik and Death Valley area to the northeast, which includes unusual concentrations of bismuth, lead, niobium, molybdenum, copper, nickel, chromium, vanadium, lithium, fluorine, scandium, silver, cesium, tin, and arsenic, among other elements defined as threshold anomalies.

In general, the geochemical and geophysical data indicate that the region might be a new metallogenic province. Interpretations of the data presently available also reveal the possibility that the alkalic intrusive bodies might include carbonatites, which would, if confirmed, expand the potential for the occurrence for other classes of mineralization.

We hypothesize that classical bio-geochemical uranium roll-front deposits occur within the McCarthy Basin, west and north-west of the outcrops of the mineralized Dry Canyon Creek pluton. To the northeast, a nearby smaller basin (i. e., a southern extension of Death Valley and possibly a subsidiary impact crater) contains previously reported uraninite in block-faulted Tertiary sedimentary rocks with lignite along its southern boundary. Anomalous base metals also occur in much older faulted rocks to the north around the northern periphery of Death Valley east of the Windy Creek pluton, which is adjacent to the McCarthy Basin. Death Valley fluvial sedimentary rocks may also offer a suitable environment for the occurrence of uranium in the form of faulted roll-front uranium deposits. Future exploration and shallow drilling and coring might produce evidence of the origin of the McCarthy Basin as a result of a Cretaceous meteor impact.

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* Note: UCOM = EMD's Uranium (Nuclear & REE) Committee, as constituted pre-July 1, 2021.