

STAMP COLLECTING

My dad was a stamp collector; no problem with that, but he never passed the passion on to me. It was a passion for my dad, and like any collecting activity it can become an obsession. Quite frequently I hear the pejorative term “stamp collecting” applied by some of my geological colleagues to the work that goes into the description of new mineral species. I always rankle at the term and consider it ill-informed.

I suppose that the view might be engendered by a lack of understanding of the significance of such an important scientific endeavour. To put it plainly, minerals are the fundamental components of the majority of the many materials studied by geoscientists. Some minerals may be rare (vanishingly so in certain cases), and some certainly may be esoteric. Nevertheless, each has its own geochemical story to tell, if we can only read the record in an appropriate way. Each mineral formed simply because the right geochemical conditions to do so prevailed at the time.

So what? The fact that we do not yet understand the formation mechanism of many of the rarer species (let alone the details concerning the common ones) means only that the appropriate work has not been carried out. It is easy to suggest why it is important to pursue studies of the formation of minerals that are generally unfamiliar to those out of the cognoscenti loop. Such studies are necessary if we want a more sophisticated understanding of the chemical and physical environment in which we live. Applications abound



FIGURE 1 Cloncurryite, Great Australia mine, Cloncurry, Queensland, Australia. FOV 1mm. PHOTO: S. HINKLEY, SPECIMEN: V. HOPPE



and include, among others, acid mine drainage (AMD) systems and other polluted environments, hydrothermal systems and alteration, dispersion of elements in the regolith, and mineral-processing technologies.

A couple of arcane examples from my own experience spring to mind. What are we to make of the “mineralogical pH meter” inherent in the mineralogy of AMD systems, and what do the rarer minerals tell us? What use might be made of the “mineralogical redox probe” intrinsic to the formation of nevedaite, $(\text{Cu}, \square, \text{Al}, \text{V})_6[\text{Al}_8(\text{PO}_4)_8\text{F}_8](\text{OH})_2(\text{H}_2\text{O})_{22}$, versus cloncurryite, $\text{Cu}_{0.56}(\text{VO})_{0.44}\text{Al}_{1.98}\text{Fe}_{0.02}(\text{PO}_4)_2\text{F}(\text{OH}) \cdot 5\text{H}_2\text{O}$, (FIG. 1), and what do the iodine-rich caliche deposits of Chile imply about the chemistry of natural aqueous solutions at the limits of the stability of water? How should we proceed to explore the ambient-temperature aqueous geochemistry of Ti in the natural environment given that secondary anatase is a reasonably common “glue” in windblown materials of the Australian regolith, and in light of a recent discovery of an unprecedented Ti(IV) sulfate, $\text{K}_3\text{Ti}^{4+}\text{Fe}^{3+}(\text{SO}_4)_4\text{O} \cdot 2\text{H}_2\text{O}$, (FIG. 2) in an oxidized sulfide ore body? Here is an aspect of geochemistry that has barely been explored.

So, I would say all strength to the elbows of the mineralogists who are, by way of further example, extending our knowledge of rare element substitution in garnet-like minerals in rather exotic skarns, some of which contain no Si ($\text{Ca}_3\text{SbSnAl}_3\text{O}_{12}$, $\text{Ca}_3\text{SbZrFe}_3\text{O}_{12}$)! Hats off too to the mineralogists exploring completely new classes of silicates that resemble intermediates between the amphiboles and the micas (although the ribbons in the structures are composites of silicates and other metallates); here is a whole new field with important ramifications for petrologists. These mineralogists and others are the vanguard telling us that we need to understand much more about what can and cannot be made on planet Earth, and what we need to be working on in laboratories in order to understand what we have to understand. We need to do this if Earth science is to continue to be a relevant, evolving and useful discipline.



FIGURE 2 $\text{K}_3\text{Ti}^{4+}\text{Fe}^{3+}(\text{SO}_4)_4\text{O} \cdot 2\text{H}_2\text{O}$ crystals (about 1.5 mm tall) on coquimbite, $\text{Fe}_2(\text{SO}_4)_3 \cdot 9\text{H}_2\text{O}$. PHOTO AND SPECIMEN: A. KAMPF

Maybe my dad was right: I should have collected stamps. But I didn't – I collected minerals, then got over collecting them just for the sake of it. If I had not proceeded thus, I would have missed the very simple question that has sustained my professional career for several decades: “How did this form and why?” The question remains a challenge for mineralogists, geologists, geochemists, chemists, physicists and theoreticians. It may never be answered in all its grandeur, and there remains an enormous amount of research that needs to be done, much of it based on the science of mineralogy. No substitute for scholarship, no more disparaging throwaway lines, bravo to the “stamp collectors”!

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