NanoSIMS mapping of ^{210}RN and ^{226}Ra in South Australian copper concentrates

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South Australian iron-oxide copper gold (IOCG) deposits contain uranium and its decay products. Efficient separation of radionuclides – specifically ^{210}Pb and ^{210}Po (hereafter ^{210}RN) from copper sulphide concentrates has proven to be difficult due to poor constraints on their mineralogical deportment and behaviour throughout the metallurgical extraction process. To date, efforts to determine host mineralogy of these radioisotopes have been complicated by concentrations far below minimum detection limits of most instrumentation – on the order of parts per trillion to quadrillion.

We present here the first direct evidence for the location of ^{210}RN and ^{226}Ra within specific mineral grains, as imaged by the Cameca nanoSIMS 50L at the University of Western Australia. Compositional maps confirm, for example, the presence of ^{210}RN in apatite (Fig. 1), brannerite, and uraninite, and of ^{226}Ra in barite.

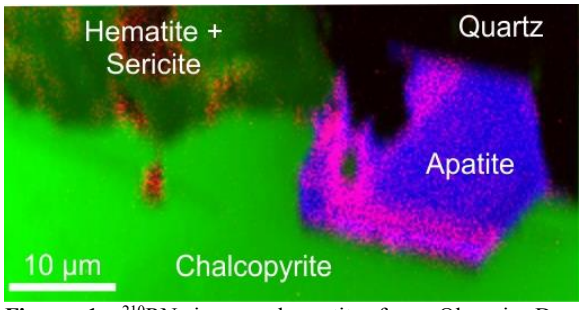

Figure 1: ^{210}RN in zoned apatite from Olympic Dam. Green = Fe, blue = Ca, red/pink = ^{210}RN.

Mapping individual grains via nanoSIMS unlocks the possibility of creating and validating a mineralogical budget for radionuclides in copper ores and their host minerals. This is a pre-requisite for develeping methods to eliminate or reduce their abundance in copper concentrates.