Nanoscale spatial distribution maps of trace elements/isotopes in Olympic Dam copper sulphide concentrates

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Copper, uranium, gold and silver are the final products from mining and processing of the supergiant Olympic Dam deposit, South Australia. The presence of economic concentrations of U necessitates a thorough understanding of the deportment of U and its daughter isotopes, both in the deposit and during extraction, to ensure efficient removal of non-economic elements. The extremely fine-grained nature of the deposit has precluded use of many conventional microscale analytical techniques, so we have begun exploring the nanoscale.

The Cameca nanoSIMS 50L is capable of providing spatial distributions of trace elements in copper ore, including ^{230}Th, ^{226}Ra, and ^{210}RN, to a resolution of 40 nm (Fig 1). Although not yet a quantifiable method, this powerful imaging technique provides invaluable insight into the deportment, mobility, and potential hosts of trace elements in the orebody. NanoSIMS isotopic mapping has been instrumental in deciphering ore formation pathways at the nanoscale.

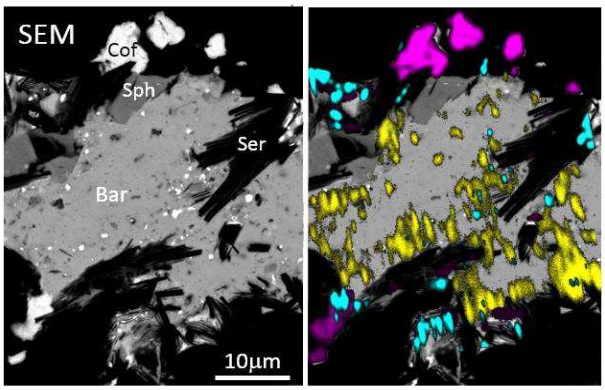

Figure 1. Barite, coffinite, sphalerite, and sericite from core 3554, Olympic Dam. Left pane shows SEM image, right pane shows nanoSIMS distribution overlays of ^{206}Pb (cyan), ^{226}Ra (yellow), and ^{238}U (magenta).