

# **Application of Nuclear Microprobes towards Understanding Complex Ore Geo-electrochemistry**

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Regions of band-bending in naturally occurring semiconducting sulfides are thought to drive electrochemical reactions with passing fluids. Metal bearing fluids within the right pH range interact with the electric fields at the surface resulting in precious metal ore genesis, even in under-saturated solutions. Metal reduction at the surface occurs via field assisted electron transfer from the semiconductor bulk to the ion in solution via surface states. Better understanding the role these regions and their texturing play on seeding ore growth requires large scale imaging of the electric field distribution near the surface and correlation with underlying trace element and defect distributions. In this paper we outline the CSIRO Nuclear Microprobe (NMP) at the University of Melbourne and recent upgrades to better handle larger area elemental mapping with Particle Induced X-ray Emission (PIXE) and Ionoluminescence (IL) microscopy. Large area PIXE maps are compared with Laser Beam Induced Current (LBIC) maps of the electric field and conclusions are drawn. We finish by discussing future directions.