Investigation of the Quartz-Gold Interface Utilizing Electron Microscopy*

Corresponding author: Michelle Burke, Miami University, burkeml2@miamioh.edu

Co-authors:
Mark P.S. Krekel, Miami University, krekelmp@miamioh.edu
John Rakovan, Miami University, rakovajf@miamioh.edu

Details of the mineralization patterns of gold in hydrothermal systems are often poorly understood. One specific aspect of mineralization that is largely unknown is the microtexture and nanotexture of the naturally-occurring interface between quartz and gold. A refined understanding of this interface could provide new insight into the details of gold mineralization and may contain indicators of the mechanisms through which gold is concentrated in ore. Furthermore, a refined understanding of the interface of gold and quartz could be useful in identifying challenges in conventional gold extraction methods and enable new extraction methods of higher efficiency to be developed. For this study, several macrocrystalline gold samples from Round Mountain and Excelsior Mountain in Nevada were investigated. Preliminary results were obtained using scanning electron microscopy (SEM) in backscatter detection (BSD) mode. Energy dispersive spectroscopy (EDS) analysis indicates that some of the material is alloyed with silver as electrum. EDS mapping confirms complex silver textures in some samples. Preliminary results indicate that there may have been a soluble phase such as a chloride or mobile phase such as elemental mercury present at the interface. Additional textural analysis suggests that gold crystal growth is dominated by the 2 dimensional growth mechanism with additional areas dominated by hopper growth. Further work will focus on near-atomic-scale work to investigate microtextures, crystallographic orientation, and interface composition to better characterize the interface. Results will provide a basis for a more refined understanding of gold deposition in many deposits in Nevada.