May 17th, 12:00 PM - 3:00 PM

Analysis of Concentric Growth Rings in Hydrothermal Epidote

Brandi Petryk
Western Washington University

Follow this and additional works at: https://cedar.wwu.edu/scholwk

Part of the Higher Education Commons

https://cedar.wwu.edu/scholwk/2017/Day_one/59

This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Scholars Week by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.
**Putting a Ring on Geological Research:**
What mineral growth can tell us about underground systems

By: Brandi Petryk, Senior, Department of Geology College of Science and Engineering
Advisor: Dr. Pete Stelling, Assistant Professor, Department of Geology College of Science and Engineering

**Introduction**
This project is giving a new meaning to “put a ring on it” with examining strange chemical growth rings in minerals. The minerals were collected from rock cores on Akutan Island, Alaska. This island is home to a volcano which has led to a hydrothermal (heated ground water) system underground.

**Methodology: analyzing microscope slides of rocks**
- Images and chemistry using WWU's scanning electron microscope (SEM)
- Chemical maps of sample 2-49-319-2 were made on WWU's SEM (Figure 5)
- Cathodoluminescence (CL) analysis at WWU (combines optical and SEM techniques; Figure 6)
- Laser ablation analyses of sample 2-49-319-2 was conducted on WWU's LA-ICP-MS (Figure 4)
- Electron Probe microanalysis (EPMA) at U. of Washington (Figures 1, 2, and 4A)

**Results**
- Zoning patterns were found in each type of analysis
- Zoning occurs when there is a change in chemical composition throughout a crystal
- Found many zoned crystals but used crystals with the widest, most distinct bands for microprobe, laser analysis
- Data from UW revealed the light bands have a higher Fe content than the dark bands (Figure 1) and in chemical maps (Figure 5)
- Trace elements vary substantially between different bands

**Discussion**
- Since the zones do not grade into each other, a rapid change in the system is causing the distinct boundaries between zones
- There is a trade off between Al and Fe in the bands. (Figures 2, 4c, 5). This supports changes in available free oxygen (oxygen fugacity)
- Trace elements change a lot between bands. This supports changes in fluid chemistry
- Conclusion: Bands are likely result of both changes in available oxygen and fluid composition

**Outstanding Questions**
- Concluding question: What causes the fluid to change?
  - Boiling? Changing fluid flow direction? Variable contributions of different fluids?