Introduction

Volcanogenic Massive Sulfides (VMS) deposits are polymetallic mineral deposits that contain many base and precious metals such as copper, zinc, lead, gold, and silver. This study focuses on two Paleoproterozoic VMS deposits found within the Penmbine-Wausau Terrane in northern Wisconsin: the Flambeau and the Eisenbrey. Despite the Flambeau and Eisenbrey being located only 4 miles from each other, they each show their own unique stratigraphy and ore mineralogy. Even though these deposits contain so much economic potential, the Flambeau is currently the only deposit to have been mined. Mining occurred between 1993 and 1997 and was closed just after the superfine ore was extracted.

By using drill core samples from the Wisconsin Geological and Natural History Survey core repository, we were able to quantify the abundances of different ore minerals throughout their ore stratigraphy using reflected light petrography and scanning electron microscopy. Certain major and trace ore minerals form under specific hydrothermal fluid conditions (e.g. Galley et al, 2007; Dubé et al, 2007); therefore, observing these mineralogical and textural variations within the ore bodies can provide important information regarding the ore-forming environments and can have implications for future mineral exploration.

Volcanogenic Massive Sulfides (VMS) deposits like the Flambeau and Eisenbrey are ancient “black smoker” deposits that are similar to those found on the modern sea floor. Hydrothermal venting can produce a relatively simple ore stratigraphy with a massive sulfide lens and the stronger zone below. Metals are leached through hot seawater-rock interactions and precipitated at or near the sea floor.

Figure 1: Location of Flambeau and Eisenbrey VMS deposits
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Conclusions

The mineralogy of the Eisenbrey Ore Zone is primarily copper-rich with only minor amounts of Zn-bearing minerals. Unique to the upper ore zone is a relative abundance of Au-bearing minerals. This zone also contains electrum and Ag-telluride minerals.

Middle Eisenbrey Ore
The middle of the ore zone is characterized by porphyry or pyrite and more abundant Cu-bearing minerals. Generally, banding thickness is thinner in this zone.

Lower Eisenbrey Ore
The lower ore zone returns to the mainly banded mineralization style found at the top of the ore body. There is a notable increase in sphalerite and galena in this zone.

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References


