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Digital near-infrared (NIR) cathodoluminescence (CL) imaging and image processing

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ABSTRACT

Infrared luminescence is recognized in many minerals; however, few reported examples of infrared cathodoluminescence (CL) imaging are cited in the literature. Low-light digital web cameras can be modified by removing their infrared blocking filters to allow the imaging of minerals and rocks in the near-infrared (NIR). Preliminary investigation of a limited number of minerals has shown that many display cathodoluminesce in the NIR. Of the minerals found to have NIR-CL, the feldspars are notable as they commonly reveal hidden details of growth and alteration not easily observed with polarized light microscopy (PLM) or normal visible CL.

Cold-cathode devices for CL have been a standard part of petrography labs for over 30 years. With the development of SEM systems for CL work, many of these older units have fallen into disuse. With the recent availability of low-cost consumer digital cameras ranging from low-light web cameras to consumer-grade megapixel cameras, most of these older CL units may be brought back into service to provide a powerful tool for petrographic research. The ease of capture of digital imagery, combined with the open-source image-processing software ImageJ, can produce high-quality images of visible and NIR cathodoluminescence of minerals in thin sections. Benefits of consumer digital cameras include the low cost, an order of magnitude below cooled cameras, and the speed and simplicity of digital imaging over film. This paper will discuss the use of modified web cameras and consumer-grade megapixel cameras for image capture and processing of visible CL and NIR-CL images.

Keywords: Near-infrared, NIR, cathodoluminescence, CL, feldspar, kyanite, fluorapatite, REE