

# Electron beam analysis and its applications

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An electron beam analysis is one of standard techniques to observe surface structures and is also applied for the chemical analysis in a broad field of the material sciences. It has been established since the 1960s, however, it has still an advantage for mineral chemistry in the earth and planetary sciences.

A Laboratory of electron probe micro-analysis is running with a Scanning Electron Microscope (SEM) and an Electron Probe Micro Analyzer (EPMA) in the Institute of Earth Sciences, Academia Sinica at Taipei.

A low-vacuum (*a.k.a.* environmental) type SEM (LV-SEM) with an energy dispersive X-ray spectrometer (EDS or EDX) and a Cathodo-luminescence (CL) is powerful equipment to observe sample surface and to make qualitative and semi-quantitative chemical analysis without sample preparation, such as polishing and coating of conductive material (carbon, gold or platinum). Since the LVSEM-EDX has been installed in April 2003 (CL: since Jan. 2005), a non-destructive and a non-invasive method have been established. There is a unique method and is able to reduce working time on EPMA because it can make mineral identification easily without conventional operation. The non-invasive technique is applying for samples from archaeology field and will be applied *the STARDUST mission* in our future work.

An EPMA, equipped with wave-length dispersive X-ray spectrometers (WDS or WDX), is a powerful tool to obtain chemical composition from a spot area (in micron order) with well accuracy with more than few hundreds ppm (parts per million). In mineralogy, the EPMA has been applied geothermo-barometry for igneous and metamorphic minerals, such as pyroxenes, based on elemental distributions. Recently, EPMA technique is being applied for newly mineral geothermometry and also geochronology.

In this talk, the presenter will introduce a basic concept of electron beam analysis and some recent examples of mineralogical studies with both SEM and EPMA.