

Quantitative isotope imaging methods using secondary ion mass spectrometry

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Direct ion imaging with secondary ion mass spectrometry (SIMS) has been developed in various fields, such as Material sciences, Earth and planetary sciences, life sciences. Especially, quantitative direct ion imaging techniques has recently developed using SCAPS detector (e.g., Yurimoto et al., 2003).

In this study, we try to develop the stigmatic secondary ion imaging methods using Cameca ims-4fE7 SIMS at Kyoto University. The imaging detector system consists of micro-channel plate (MCP), florescent screen and Cooled 16bit charged-coupled device (CCD) camera (BU-LN52 Bitrun Co.). This conventional imaging system needs to estimate the calibration parameter with conversion from ion to electron, and from electron to photon.

In principle, each micro-channel of MCP would be different conversion parameter for electron converted from secondary ions. Therefore, in order to estimate the qualitative ion imaging using this system, we need to estimate the error of this conversion parameter in different location of each channel.

In this talk, we introduce the estimation of calibration parameter between the light output count rate read by CCD camera and the count rate of secondary ions incident on MCP with different experimetal session. We will estimate the error of each nonlinear exponent parameter for five places (50 x 50 pixels) and these different parameter cause the error of about 5%. We will discuss it in detail with quantitative isotope imaging with application of high-pressure experiments.

Keywords: Isotope imaging, SIMS, Hydrogen, Carbon