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Mass separation of AuGe alloy using a new principle: rotating electric fields



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The authors have been developing rotating electric fields (REFs) type mass analyzer, which can be applied for new principle mass filter for fabrication process or elemental analysis. This mass analyzer can realize the continuous ion beam separation with wide mass ranges and simultaneous detections. According to the new principle, which involves introducing a pair of REFs, once a proper rotating frequency is supplied for specific ion, the ion begins to draw cycloid trajectory and reaches the top on a half revolution in the first REF. Then the ion draws a mirror trajectory and converges to the initial axis by an opposite phase field on the second REF. In earlier studies, the authors have mass separated AuGe-focused ions beam (FIB) and obtained typical mass annular patterns on proper frequencies of REFs. However, the origins of these annular patterns could not be identified. Therefore, in this study, they identified the origins of the unknown annular patterns by theoretical calculations and time-of-flight secondary ion mass spectrometry (TOF-SIMS) imaging. Consequently, it is observed that the experimental annular patterns and the result of theoretical calculation have similarities in terms of the linearity and the distribution of the annular patterns from the theoretical calculation results agreed with the distribution of the annular patterns from the TOF-SIMS imaging results. From these result, the authors succeeded to identify the origins of the unknown annular patterns and confirmed that REFs type mass analyzer strongly separates different masses/isotopes of AuGe alloy.

Biography

Tokio Norikawa was born in Fukui prefecture in 1994. Now, he is belonging to the graduate school of science and technology of Tokyo University of Science. He took a part of winners of the Karen award in the 20th the scientific international symposium on SIMS and related techniques based on ion-solid interactions 2018 in Tokyo (T. Norikawa, N. Kishimoto and M. Nojima, "Mass separation of AuGe alloy using rotating electric fields II"). His research area is instrumentation of new type mass analyzers using fine focused ion beams.

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