



Contribution ID: 140

Type: **Poster presentation**

Development of an Electron Attachment Type Negative Fullerene Ion Source

Tuesday 17 October 2017 18:45 (15 minutes)

Intensification of negative fullerene (C_{60}) ion beam current from an ion source is indispensable for research and developments using a MeV energy C_{60} ion beam with a tandem accelerator. Generally, a cesium sputtering type ion source has been used to generate a negative C_{60} ion beam. An average current of the negative C_{60} ion beam is about 50 pA, and the current goes down to 1/100 within an hour or less because the C_{60} molecules in a sputter cathode were broken by the impact of cesium ion [1]. Therefore, we are developing an electron attachment type C_{60} negative ion source alternative to the cesium sputtering type ion source. A C_{60} has a high electron affinity of 2.65 eV, and the electron attachment cross section is high when the electron energy ranges from 0.2 to 12 eV. In this method, the sublimed C_{60} is negatively ionized by capturing a low energy electron. A new ion source which is composed of an ion generation chamber, a sample vaporization oven, and a filament as an electron supplying source has been made. The negative ion generation test with the ion source is performed in off-line test stand equipped with an analyzing magnet. As a result, the $C_{60}^{⁻}$ beam current of 600 nA is able to extract at the beam energy of 3 keV. In addition to the thermal electrons emitted from the filament, low energy electrons emitted by ionization of C_{60} might be contributing to the generation of negative $C_{60}^{⁻}$ ions, because the positive $C_{60}^{⁺}$ ions are generated at the same time. The current can be kept constant more than 10 hours by gradually increasing the oven temperature and the filament current. Details of the ion source and the results of negative $C_{60}^{⁻}$ ion generation test will be reported at the conference.

References

[1] B. Waast et. al., Nucl. Instrum. Methods Phys. Res. A 382, 348 (1996).

Author: YAMADA, Keisuke (National Institutes for Quantum and Radiological Science and Technology)

Co-authors: CHIBA, Atsuya (National Institutes for Quantum and Radiological Science and Technology); HIRANO, Yoshimi (National Institutes for Quantum and Radiological Science and Technology); SAITOH, Yuichi (National Institutes for Quantum and Radiological Science and Technology)

Presenter: YAMADA, Keisuke (National Institutes for Quantum and Radiological Science and Technology)

Session Classification: Poster Session 2

Track Classification: Negative ion sources