Contribution ID: **33** Type: **Contributed talk**

MR-TOF-MS for nuclear physics facilitate a new class of experiments in analytical mass spectrometry

Tuesday, 9 June 2015 12:20 (20 minutes)

The developments of mass spectrometers for ever higher performance has historically been driven by the needs from nuclear physics. One of the latest developments are multiple-reflection time-of-flight mass spectrometers (MR-TOF-MS) that have recently been installed at different low energy radioactive ion beam facilities. They are used as isobar separators with high ion capacity and/or mass spectrometers with high mass resolving power and accuracy for short-lived nuclei.
The devices also have a wide potential in other research fields such as space science, medicine, biology, chemistry and homeland security.
Based on the MR-TOF-MS[1] developed for the FRS Ion Catcher Experiment at GSI, Germany, a mobile MR-TOF-MS dedicated for in-situ analytical measurements has been developed at the Justus-Liebig-University Giessen[2,3]. The device including all electronics, roughing pump and data-acquisition has a volume of 0.8 m^3, a mass resolving power up to 400,000 and is equipped with an atmospheric pressure inlet. Thus, in-situ measurements can be performed without the need of any sample preparation. In addition to highly resolved and accurate mass measurements, the device offers unique tandem mass spectrometry capability via mass selective ion re-trapping with (ultra)-high mass separation power (R > 50,000). By tandem mass spectrometry structural information and unambiguous identification are provided. Mass selective ion re-trapping offers more than an order of magnitude higher separation power than commercially available mass separators. Thereby a new class of experiments with higher selectivity and sensitivity becomes possible in various fields of life science.
Envisaged applications are in environment sciences (e. g. to monitor the water and air quality on hot spots) and in medicine (e. g. to instantaneously distinguish between healthy and cancerous tissue during surgery).
[1] T. Dickel et al., Nucl. Instrum. Methods A 777 (2015) 172-188
[2] T. Dickel et al., Nucl. Instrum. Methods B 317 (2013) 779-784
[3] J.Lang, PhD thesis in preparation

Primary author: DICKEL, Timo (GSI, Darmstadt)

Co-authors: Dr PIKHTELEV, Alexander (BINEPCP RAS, Chernogolovka, Moscow region, Russia,); SCHEIDENBERGER, Christoph (GSI, Darmstadt); GEISSEL, Hans (GSI, Darmstadt); Mr LANG, Johannes (JLU, Giessen); Mr BERGMANN, Julian (JLU, Giessen); Prof. YAVOR, Mikhail I. (Institute for Analytical Instrumentation, RAS, St. Petersburg, Russia); Mr AYET SAN ANDRÉS, Samuel (GSI, Darmstadt); Mr LIPPERT, Wayne (JLU, Giessen); Dr PLAß, Wolfgang (GSI, Darmstadt)

Presenter: DICKEL, Timo (GSI, Darmstadt)

Session Classification: Application of nuclear physics to other fields

Track Classification: Application of nuclear physics to other fields