AMS applications for the Earth Science - Topics utilizing Be-10 -

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AMS (Accelerator Mass Spectrometry) is a kind of mass spectrometry in which samples to be analysed is accelerated to be an ion with MeV/nucleon order by an accelerator. A molecular ion with such energy can be easily decomposed. And Z value (atomic number) of an atomic ion can be identified by detecting the energy losses in gases or semi-conductors. Hence AMS can separate isobars and isobaric molecules from nucleus interested so that extremely high sensitive mass spectrometry is realized.

Be-10, C-14, Al-26, Cl-36, I-129 are major isotopes in the field of AMS today. Among them C-14 is most widely measured and nobody doubt its importance on various research fields. Although Be-10 and Al-26 are also useful isotopes, they are not fully recognized in Japan. At MALT (Micro Analysis Laboratory, Tandem accelerator), Research Center for Nuclear Science and Technology, The University of Tokyo, Be-10 and Al-26 AMS systems have been developed since early stage of world wide AMS development. MALT is now the only laboratory in Japan at which these isotopes are routinely measured.

In this presentation, after brief introduction of MALT AMS system and its performance, potentials and problems in the applications of Be-10 and Al-26 for the earth science are discussed. Discussion will focus on two topics following:

1)Most Be-10 detected on the earth is produced in the upper atmosphere by the interaction with cosmic rays. It sticks to aerosol and precipitates with rainfall. Detailed examinations of physical and chemical behaviors of 10Be in various environmental systems are needed for proper use of Be-10 as a precise clock or a reliable tracer. However there are many questions about transfer processes of Be-10 precipitated on land. Here with re-arranging the questions, the way and direction for the solution will be considered. In the 9th International Conference on Accelerator Mass Spectrometry (AMS-9, Sept. of 2002 in Japan) a proper workshop for this theme will be held.

2)To measure terrestrial in situ cosmogenic nuclides (TCN, clearly distinct from the atmospheric production), Be-10, Al-26 and Cl-36 in rocks, their surface exposure ages and erosion rates can be figured out(TCN exposure history methods). This method has been rapidly improved in these several years in both technical and theoretical areas to be an important method for addressing various questions on the earth science. Because the production rates in surficial rocks are commonly several orders of magnitude less than average rates in the atmosphere, the practical use of this method requires highly sensitive and fully reliable AMS system including from the sample treatment process to the final detection system of AMS measurements. Here overall performance of MALT AMS system is evaluated from the view of TCN exposure history methods and problems to be solved are discussed.