6 - 17 Operation Status of 320 kV Platform for Multi-discipline Research with Highly Charged Ions

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In 2012, 37 physical experiments were carried out on the 320 kV platform for multi-discipline research with highly charged ions, 25 of which were devoted to domestically and internationally collaborative researches. The total operation time in 2012 is 6010 h including beam time of 4980 h corresponding to the beam efficiency of 83%. Failure time accounts for 6.3% of the total operation time, and preparation time for tuning new ions accounts for 10.7%.

Ion beams from 17 elements, H, He, C, N, O, Ne, Ar, Kr, Xe, Bi, Fe, Cs, I, Si, Ni, T and Mg, with 73 charge states were provided by the platform. The energy of the ion beams ranged from 7 keV to 8 MeV, the extraction voltage from 7 to 300 kV. Most of the beam time was for H, He, Xe and Fe ion beam.

Si, Ni, Ti, Mg and Ca ion beams were firstly delivered by the platform in 2012. Despite the fact that Si ions are easy to be obtained in ECR ion sources, the material SiH_4 used to produce Si ions is hard to handle due to its explosiveness. Extensive test on oven technique was done with Ni and Ti. 12 eμA of Ni^{17+} and 45 eμA of Ti^{13+} were produced at an extraction voltage of 15 kV and RF power of 400 W. However these current intensities could not bemaintained for long term because the power of the oven was close to its limit, i. e. 160 W in the case of Ni and 170 W for Ti, which led to the break of the heating cord and the instability of the vapor pressure. Therefore high voltage ovens are required to produce stable ion beams from refractory metals.

The platform will be commissioned to produce and accelerate ion beams of ^{238}U in 2013. If this goal was achieved it would mean the realization of all ions acceleration for the 320 kV platform and would enhance the general performance of the platform.

In last years the requirements for highly charged ions with low energy have been increasing from various disciplines, especially from radiation induced modification of materials. The heavy ion beams with low-to-medium energy delivered by the 320 kV platform have been widely used in material physics, nuclear astrophysics, plasma physics and atomic and molecule physics and so on.

The 320 kV platform has been incorporated into the regional large-scale instrument center of the Lanzhou branch of CAS in 2012, and was honored as the advance machine. Its utilization ratio amounted up to 556%, and sharing ratio up to 171% that is far advance of other machines.

Necessary measures have been taken for radiation protection in the laboratory. And the environment of the lab has also been greatly improved.

Some equipment of the platform has been degenerated due to the long-term running, so some experimental requirements cannot be met. In order to improve the operation efficiency of the platform, modifications and upgrades are planned to be done in 2013.