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Preliminary Results of Positive Ion Mass Spectrometry Based on a 2.45 GHz ECR Ion Source and a Non-Metallic Gas Target

Positive-ion mass spectrometry (PIMS) is a positive-to-negative ion conversion metrology instead of traditional accelerator mass spectrometry (AMS) on high-precision radiocarbon dating. To demonstrate the probability of PIMS with a 2.45 GHz ECR ion source, an experiment was launched at Peking University (PKU). A compact permanent magnet 2.45 GHz ECR ion source is designed to produce carbon ions from CO₂. A CXC unit was installed after the extraction system and ethylene is chosen as charge exchange gas. A dipole is employed for beam analysis. A faraday cup installed at the end of the beamline is used for beam current measurement. Preliminary experiments prove that more than hundreds of microamp of C₂⁺ beam can be produced with this ECR source. By injecting ethylene into CXC, several microamp C⁻ beam was detected and the C₂⁺ ions charge exchange efficiency to C⁻ ions can reach to 5%.

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