MAGNETIC SPECTROMETRY OF DEUTERON SPECTRA IN PLASMA FOCUS DEVICE

M. V. Roshan, A. Talebitaher, R. S. Rawat, P. Lee,
S. V. Springham
Institution National Institute of Education, Nanyang Technological University, Singapore

Magnetic spectrometry using polymer nuclear track detectors is used for high-resolution measurement of the energy spectrum of deuterons emitted from the pinch-column of the NX2 plasma focus (PF). The spectrum is measured for single PF shots. A 25 μm pinhole images the deuteron source on the spectrometer. This pinhole enables differential vacuum to be performed between the plasma focus and spectrometer chambers. Deuteron tracks are measured with an automated scanning system. The detectors are imaged at ×20 objective magnification, for which the CCD field of view is 528×379 μm^2. Then the spectrum on the detector is scanned in a path comprising about 1500 images. The recognized and counted tracks are accumulated in a histogram of track displacement in bins representing equal energy stripes on the detector. A very distinct neutrals spot is clearly visible for each spectrum, resulting from uncharged deuterons passing through the spectrometer in straight-line paths and producing a densely tracked zone. The deuteron trajectory in the magnetic field is calculated in order to obtain the deuteron energy as a function of the distance from the neutrals spot on the detector. The deuteron spectrum $d^2N/dEd\Omega$ is derived from the track displacement histogram. The deuteron spectrum is used to estimate the beam-target contribution for fusion neutron production. The number of Nitrogen-13 nuclides in the activation of graphite through $^{12}C(d,n)^{13}N$ is estimated using the deuteron spectra and the thick target yield.