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In-situ measurement of low Z coating thickness on metal substrates[1] A.L. ROQUEMORE, M. JAWORSKI, C.H. SKINNER, J. MILLER, Princeton Plasma Physics Laboratory — The surface composition of plasma facing components in magnetic fusion devices critically affects plasma performance but is difficult to measure in situ. We have used a compact assembly of an annular solid state detector and alpha particle source to employ Rutherford backscattering (RBS) to measure the thickness of a coating of low Z material on a heavier substrate in as little as 2 hours per location. RBS of energetic particles is typically used as a technique to measure near surface concentrations of high Z atoms in a substrate comprised mainly of lighter atoms. We have demonstrated its utility to determine the thickness of a coating of a low Z material on a heavier substrate in a short time. With a moveable probe, this technique could be used to provide an in situ thickness measurement of the Be, Li, B, and C coatings on metal tiles in 2 hours per location. A test stand was used to determine the range of low-Z thicknesses that can be measured on Mo tiles. The detector and electronics were calibrated by detecting the 5.423 MeV alpha particles emitted from a thin, 1 nCi, ^{241}Am source. This enabled the energy spectrum emitted from the thicker 0.1 mCi source to be measured (4.24 MeV centroid and 0.62 MeV FWHM) and the energy loss of the alpha particles in the low Z coating to be determined. A Monte Carlo program was used to investigate effects of the large energy spread of the thick 0.1 mCi source and of the detailed geometrical setup.

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