performed using pairs of carbon foils conclusively demonstrate, for the first time, that the passage of molecular ions (\(^{12}\)CH\(_2\) and \(^{13}\)CH) through a pair of thin carbon stripping foils at 1 MeV results in significantly increased attenuation of molecular ions in the 2\(^+\) charge state as compared to passage through a single carbon foil of comparable total thickness. The detected molecular counts after passage through a single 4.4 \(\mu\)g/cm\(^2\) foil correspond to a surviving fraction of 7-47 \(\times\) 10\(^{-11}\), depending on the assumed energy and angular spread introduced by the foil. No statistically significant molecular survival was observed for pairs of stripping foils with a combined thickness of 4.0-4.6 \(\mu\)g/cm\(^2\). The upper limit on surviving molecular fraction for the double foils was a factor of 15 lower than for a single foil of comparable thickness. These results show that a low-energy AMS system based on the detection of \(^{14}\)C in the 2\(^+\) charge state after a foil stripper will provide more than adequate discrimination for the analysis of biomedical samples labeled at or above contemporary \(^{14}\)C and that low-energy systems employing double foils may be potentially useful for radiocarbon dating.

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MEASUREMENTS OF PROTON- AND NEUTRON-INDUCED PRODUCTION CROSS SECTIONS FOR \(^{36}\)Cl FROM Ca AND K

M. IMAMURA, K. NISHIIZUMI, M. W. CAFFEE and S. SHIBATA

Production cross sections for \(^{36}\)Cl have been measured for the nat.K(p,x), \(^{39}\)K(p,x), nat.Ca(p,x), and \(^{40}\)Ca(p,x) reactions. In addition to these proton reactions, neutron cross sections up to 40 MeV for the nat.K(n,x) and nat.Ca(n,x) reactions have also been measured.

Radionuclides produced in extraterrestrial surface materials by energetic solar flare particles provide clues about the history of solar activity. Changes in solar activity are reflected in the particle intensities and energy spectra averaged over the mean lives of the radionuclides measured (Reedy et al. 1983). Recently Nishiizumi et al. measured a \(^{36}\)Cl depth profile in lunar surface rock 74275 (1991) and 64455 (1995). The observed profiles of \(^{36}\)Cl in the top several g/cm\(^2\) were discussed with the constancy of solar energetic particle flux and spectrum using new \(^{36}\)Cl production cross sections. Since investigation of the solar flare energetic particle intensity over the past half million years absolutely requires \(^{36}\)Cl production cross sections from the major target elements Ca and K, CaCO\(_3\) and KNO\(_3\) targets were bombarded with both protons from the INS SF cyclotron and semi-monoenergetic neutrons (produced via the \(^{7}\)Li(p,n) reactions using the same cyclotron). For the proton bombardments we used both natural and isotopically enriched targets. These targets were subsequently chemically processed after adding Cl carriers, following which the \(^{36}\)Cl activities were measured by AMS at LLNL.

Figures 1 and 2 (not given here) show the proton-induced production cross sections for Ca and K targets, respectively. Figure 1 also displays the data recently reported by Shiekel et al. (1994). We will present neutron-induced cross sections as well.

REFERENCES


\(^{1}\)Institute for Nuclear Study, University of Tokyo, Tanashi, Tokyo 188 Japan