NOTICE

PORTIONS OF THIS REPORT ARE ILLEGIBLE. It has been reproduced from the best available copy to permit the broadest possible availability.

ANL-HEP-CP-84-62
For the Proceedings of the 4th Workshop on Polarized Target Materials and Techniques Bonn, West German September, 1984

RADIATION DAMAGE IN AN ETHYLAMINE-BORANE:AMMONIA TARGET

CONF-8409134--2

D. G. Crabb

University of Michigan
Ann Arbor, Michigan 48109

ANL-HEP-CP--84-62

DE85 017492

D. Hill

Argonne National Laboratory
Argonne, Illinois 60439

27 August 1984

MASTER

In the course of an experiment at the Brookhaven AGS to measure A_{NN} in pp elastic scattering at 16 GeV/c, we have subjected a polarized target of ethylamine (85 wt.%) + borane-ammonia (15 wt.%) + EHBA-Cr^{V} (4×10^{19}/mℓ) to an integrated beam flux of ~ $10^{14}/cm^2$. The target beads were prepared[1] at Argonne and shipped at LN_2 temperature to BNL. The ^3He refrigerator services a target of ~ 25 cm^3 volume, at 2.5T.

Two separate bead loads were used. The first load was polarized at a refrigerant temperature of ~ 0.49K with a mixture of $^3He/^4He$ as refrigerant, with the results:

$$P = +75\%, -73\%$$

$$\Delta\nu_e = 0.36 \text{ GHz} .$$

The submitted manuscript has been authored by a contractor of the U. S. Government under contract No. W-31-109-ENG-38. Accordingly, the U. S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or allow others to do so, for U. S. Government purposes.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

The second load was initially run with the $^3He/^4He$ mixture, and later run at ~ 0.47K with pure ^3He as the refrigerant; it gave initial polarizations of

$$P \simeq +74\%, -71\% .$$

Frequency modulation of the microwaves was not used in either case. The second load was used for the rest of the results presented here.

Figure 1 shows the evolution of the polarization as a function of irradiation. The break in the curves coincides with the change of refrigerant. The effective cross-sectional area of the target is ~ 3.1 cm^2; the values on the abscissa should be divided by this number in order to estimate the flux. The slopes of the lines correspond to

$$\phi_0(+) = 7 \times 10^{14}/cm^2$$
$$\phi_0(-) = 3.5 \times 10^{14}/cm^2.$$

Thus, the radiation tolerance of this material seems to be roughly comparable to that of butanol-porphyrexide, and well below that of irradiated NH_3.

Figure 2 shows polarization build-up curves at different levels of irradiation. Curves (a) correspond to ~ 1.1×10^{14} total protons, and curves (b) to ~ 3.1×10^{14} total protons. We obtain $\tau_{.7}(+) \simeq 20$ min., $\tau_{.7}(-) \simeq 14$ min. at either level of dose. These build-up times are substantially shorter than those that we have been able to attain thus far in irradiated NH_3.

REFERENCES

1. See D. Hill, J. Hill, and M. Krumpolc, elsewhere in this Workshop.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

FIGURE CAPTIONS

1. Evolution of the maximum polarization vs. dose. The crosses are for positive enhancement and the open circles, negative. The lines are drawn by eye.
2. Polarization build-up for two doses (a) ~ 1.1×10^{14} total protons, (b) ~ 3.1×10^{14} total protons. The microwave power applied is ~ twice optimum.

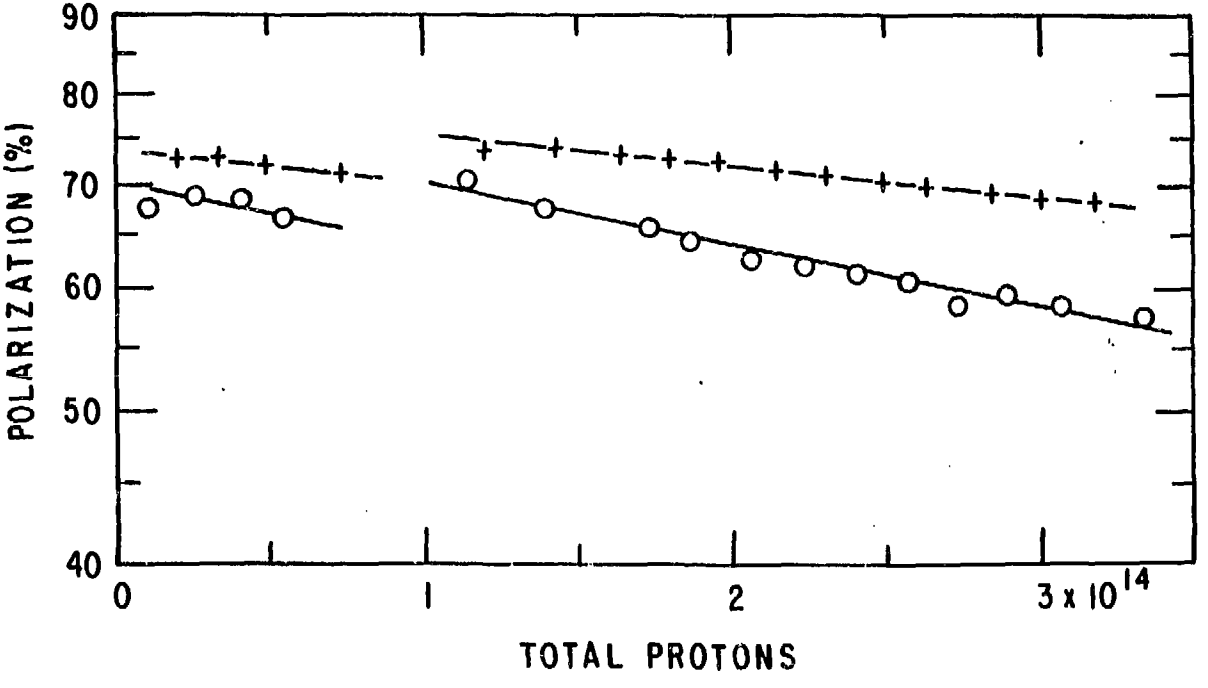

Figure 1

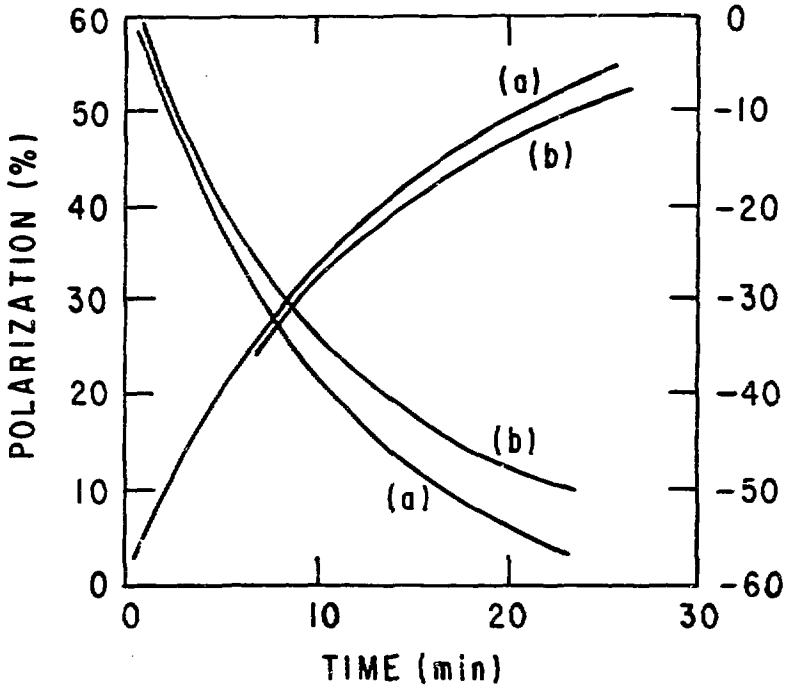
60
50
40
30
20
10
0
POLARIZATION (%)
0
-10
-20
-30
-40
-50
-60
(a)
(b)
(b)
(a)
0
10
20
30
TIME (min)

Figure 2