A honeycomb solid target design

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Introduction

Solid targets for PET and SPECT radionuclides are getting popular. For radiohalogens the limiting factor, beside the high cost of enriched target material is beam current due to poor heat conductivity of the target material(s). We have designed a honeycomb solid target which has advantages over the traditional circular hole design: 1) Even distribution of target material, 2) it takes higher beam current, 3) less target material loss during distillation (1) and 4) no "creeping" (surface tension phenomena) of the target material during distillation.

Material and Methods

The target (see fig. 1.) consists of 19 hexagonal 0,3mm deep openings (see fig.2.) thus having 84% transparency/transmission, in a 24mm X 2mm platinum disk. There is a 10mm circular cavity on the reverse side giving a 200µm thickness of the platinum. The irradiations were performed on an IBA twin 18/18 Cyclon equipped with a Costis sold target system.

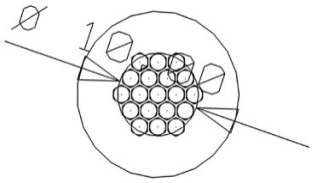

Figure 1. The honeycomb target

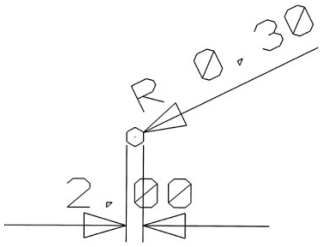

Figure 2. The hexagonal aperture

The target material thickness was ~300mg/cm^2 $^{124}TeO_2$ (>99,9% I.E., Isoflex) with 5% *w*/*w* Al2O3 (99.99%,Sigma-Aldrich). The target was irradiated with 14.8MeV protons (18MeV degraded by 500µm aluminium).

Results and Conclusion

The target was able to take beam current up to ~35µA (higher BCs have not yet been investigated); our "traditional" target (10mm circular hole) has a limit of ~20µA. This means that the effective yield is ~50% higher with the honeycomb as compared with the "traditional" target design.

References

1. J. Fonslet and J. Koziorowski: *Appl. Sci.*, ***3***(4), 675-683, 2013.

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