

Study of different PADC materials with regard to sensitivity and background

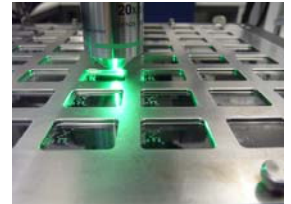
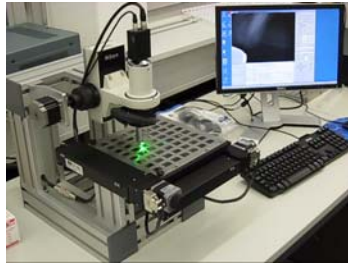


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1. Introduction

Solid state neutron track dosimetry on the basis of PADC (Poly allyl diglicol carbonate) material is done at PSI since 1996. The major problem in routine application of solid state neutron track dosimetry with PADC material has been the batch-to-batch and even sheet-to-sheet variability in both sensitivity and background. To guarantee reliable personal dosimetry quality assurance is applied routinely. One part of the quality assurance is the acceptance test where the sensitivity and background is tested.



The goal of the present study was two folded. On one side the performance of the TASL track analysis system was studied on three different PADC materials using the etching procedure which is recommended by TASL. On the other side the variability in both sensitivity and background was compared between three different PADC materials.

2. Materials and Method

The PADC material used for the tests has been produced by Thermo Electron (USA, denoted as TE), Track Analysis System Limited (UK, denoted as TASL) and Chiyoda Technol Corporation (Japan, denoted as Tech).

For the tests two sheets have been employed of each manufacturer. For each material 60 detectors have been randomly selected from one sheet and irradiated to a personal dose equivalent $H_p(10)$ of 3 mSv in the standard PSI neutron badge with an $^{241}\text{Am-Be}$ source at the accredited calibration laboratory at PSI. The other 60 randomly selected detectors from the second sheet have been used as background detectors.

All detectors were etched with the same etching procedure: 2 h 50 min at 85 °C in 6.25 M sodium hydroxide. The tracks on the detectors were then counted with the TASL image system.



3. Results and Conclusion

The comparison of different parameters, such as sensitivity, S , net mean track density, N , for a dose of $H_p(10)=3$ mSv at $^{241}\text{Am-Be}$, mean track density for background detectors, B , and detection limit, LDD , is presented in the Table.

Material	S for $^{241}\text{Am-Be}$ ($\text{cm}^{-2} \text{mSv}^{-1}$)	N (cm^{-2})	B (cm^{-2})	LDD (mSv)
TE	459.6 ± 46.8	1379 ± 13	0.2 ± 1.1	0.1
TASL	225.9 ± 23.7	678 ± 11	-1.8 ± 0.5	0.1
Tech	255.8 ± 26.8	767 ± 12	0.0 ± 0.7	0.1

The sensitivity and background were studied of three different commercial available materials. From the comparison it can be concluded that all materials can be used with the TASL etching procedure. However, the sensitivity of the three materials is different.

