

Updating of PGAA System at HANARO Research Reactor

150

(HANARO) ST 1
(prompt gamma-ray activation analysis; PGAA)

(PG) BF_3 , laser optical
diffraction angle control beam profile , PG
PG Au ,
Compton
PGAA $8.1 \pm 0.2 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$ 40%

가

Abstract

In this study, updating of prompt γ -ray neutron activation analysis system (PGAA) has been carried out to obtain the best, optimal condition through the improvement of neutron flux and reduction of background of PGAA facility which is installed on the ST 1 horizontal beam port at HANARO research reactor. Both diffracted beam profiling's conditions and the neutron diffraction of pyrolytic graphite crystals are investigated by BF_3 counter, laser and optical diffraction angle control method to confirm the beam convergence rate. Also, the effects of interference materials such as aluminum sample holder, teflon holder and Teflon wire appeared from analyzing elemental constituent are investigated with single- and Compton mode. After readjusting of system, the neutron flux measured was $8.1 \pm 0.2 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$ increasing about 40%, to be expected the improved analytical sensitivity.

1.

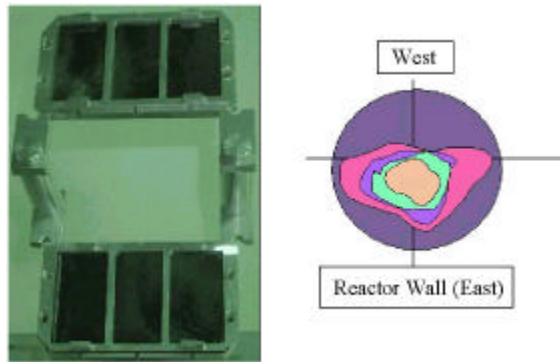
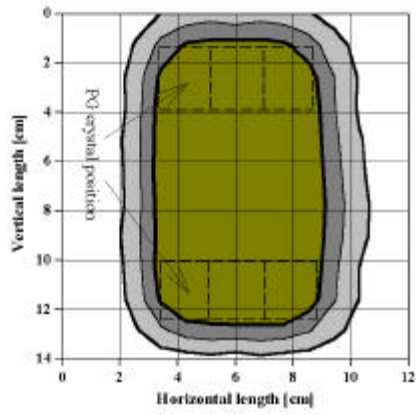
(Prompt Gamma-ray Neutron Activation Analysis: PGAA)
(Neutron Activation Analysis, NAA)

PGAA
가
Compton continuum escape
PGAA
가
가
annihilation pair spectrometric
[1].

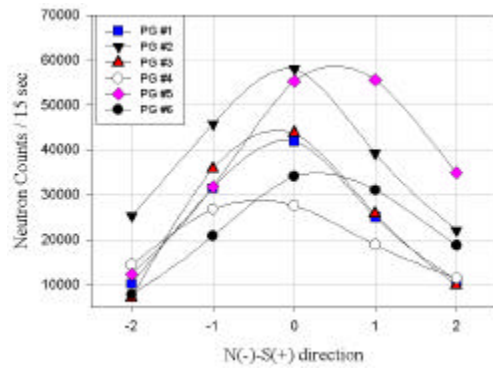
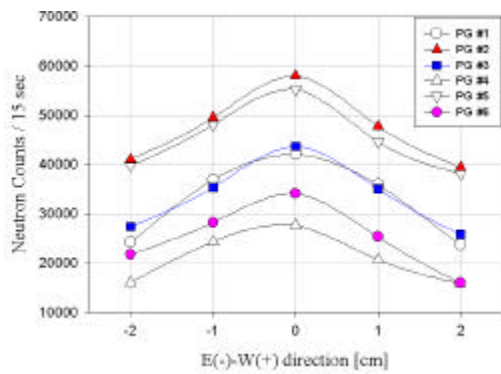
beam profile
가
Compton

2.

PGAA (HANARO) ST 1
[2].
pyrolytic graphite (PG)가
가 20 mm가
25 cm 가
BF₃ pin-hole stage
, PG laser 1mm
pin-hole , x-y stage 2
. BF₃ LND 20240(가 : 200 torr,
: 850-1100V, 가 : 950V) 2 goniometer
, ADC, Timer & Counter
gain shaping time
100×0.75 0.25μs ADC gain 16k
gold monitor(Rx Experiment
Co., USA, 99.998% purity activation wire) (2x2



2. PG , laser

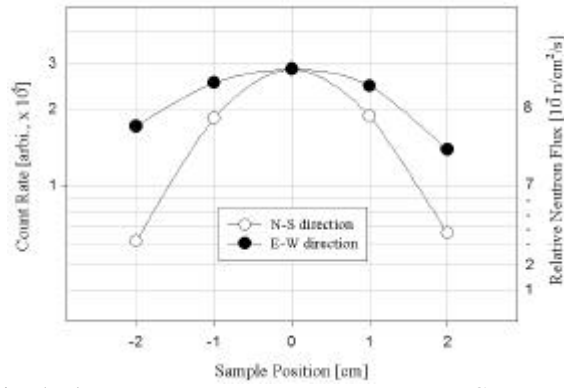


3. BF₃ PG

[4] PG
 $7.6 \sim 9.2 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$
 가

BF_3
 PG
 [4]
 10 mm 6%

가 [4]



4. Pin-hole type BF_3 PG

$8.1 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$
 $7.8 \pm 0.2 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$
 10 mm

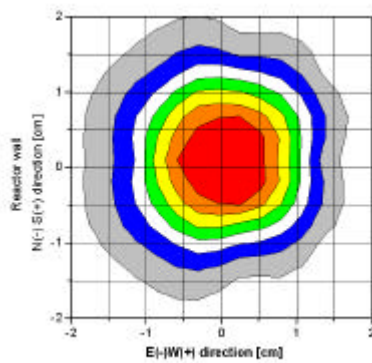
BF_3
 5 mm
 $6.2 \pm 0.7 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$
 5 mm 20%

[5]

가 ,

10 mm

가 10 mm



5.

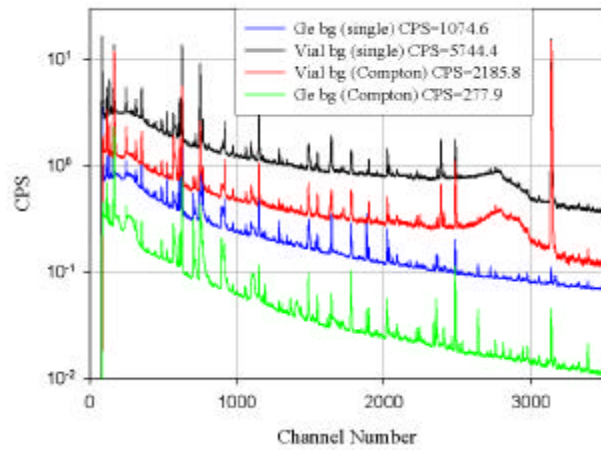
43% 1332 keV BGO trigger logic

n HPGe 0.5 mm beryllium ^{60}Co

2.2 keV 가 . 8 BGO Ge

[6] 가 1/6 1/3 가

Compton continuum (coincidence counting method)



6. PGAA background

- [1] Zeev B. Alfassi and Chien Chung, *Prompt Gamma Neutron Activation Analysis*, Eds., CRC Press, Inc., Boca Raton, 1995.
- [2] Kent J. Riley, Otto K. Harling, An improved prompt neutron activation analysis facility using a focused diffracted neutron beam, *Nucl. Inst. and Methods in Physics Research*, 143 (1998) 414-421.