

Study on Background Interference on the PGAA System

150

40 % 가 , $8.1 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$ 가

NaI(Tl)/BGO , HPGe
 ${}^6\text{LiF}$

Abstract

The performance of the prompt gamma-ray activation analysis (PGAA) system at the HANARO research reactor has been improved by a series modifications. These modifications have been increased the flux by a factor of 40% at the sample position to $8.1 \times 10^7 \text{ n cm}^{-2} \text{ s}^{-1}$, and decreased on the average of background from sample holder devices. The background has been occurred by using Al and teflon device at the sample position. By using a Compton suppression spectrometer, surrounding of a central germanium detector in a NaI(Tl)/BGO scintillator, the peak-to-background ratio is expected to be improved by four or five order of magnitude in the low energy region. The ${}^6\text{LiF}$ tiles are placed at the entrance of the collimator and at the front of detector to prevent the neutrons directly incident on the detector. From this condition the influence of background is improved for the high quality elemental concentration data from thermal neutron capture.

1.

가

가 가
(Prompt Gamma-ray Neutron

Activation Analysis: PGAA)

가 가

PGAA

가

Compton continuum

pair production escape 가

PGAA

가

가

annihilation pair spectrometric
PGAA

[1].

B

Na

NaCl

99.999% boric acid (H_3BO_3)

2.

PGAA [Fig. 1]

ST 1
pyrolytic graphite (PG)가

(beam collimator)

borated plastic,

가 $2 \times 2 \text{ cm}^2$

^{10}B ^6Li

. PGAA

steel

(10×15×30 cm³)
 20 mm
 (2 mm) graphite(4 mm) ⁶LiF (0.2 mm)
 가
 [Fig. 2] 1 mm LiF 20 mm
 mm
 LiF 100 mm
 4 mm borated plastic, 100 mm
 25 cm 가
 HPGe 8 BGO (annulus)
 [2, 3].
 n HPGe 0.5mm beryllium
⁶⁰Co 43 % 1332 keV 2.2 keV 가
 5mm
 , [Fig 2]
 vial Na
 [4].
 3.
 PGAA vial [Fig. 3]
 730~760 478 keV
 12.8 keV
 가 (Na) 472
 keV 478 keV가 가 [Fig. 4].
 (cps) 가 0.99 cps, blank vial 가
 1.80 cps
 blank vial 가 가 [Fig. 5].
 vial Na 가 가 [Fig. 4]
 , 가 1/5 1/4

continuum
method) Compton
(coincidence counting

NaCl Na Na 472 keV
[Fig. 6] Na fitting 가 fitting
Na fitting
Na 472 keV Na , vial
[Fig. 7] Na Gaussian fitting Na

4.

()

LiF , HPGe
vial
Compton
Compton continuum 4
vial 0.02 mm film

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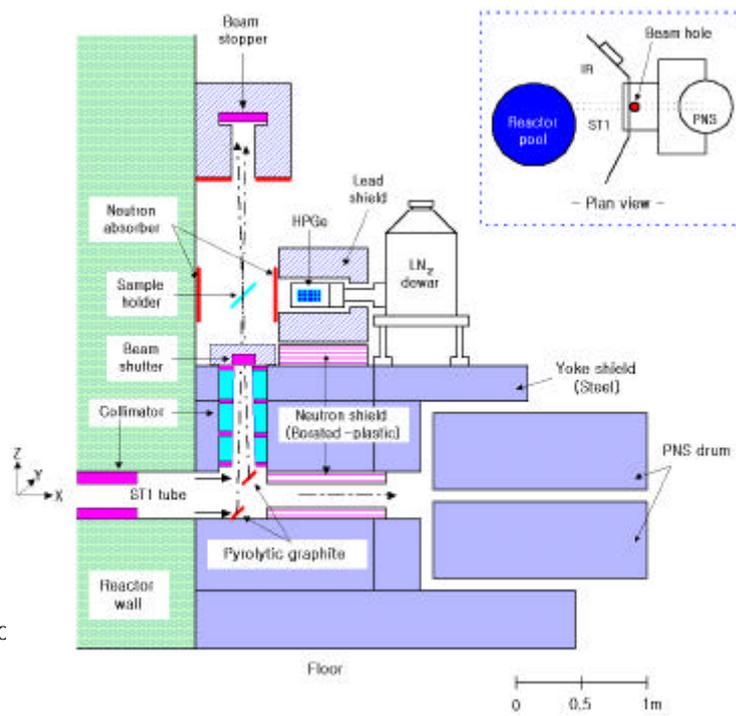


Fig. 1. Layc



Fig. 2. Sample device and ${}^6\text{LiF}$ tile on the beam shutter

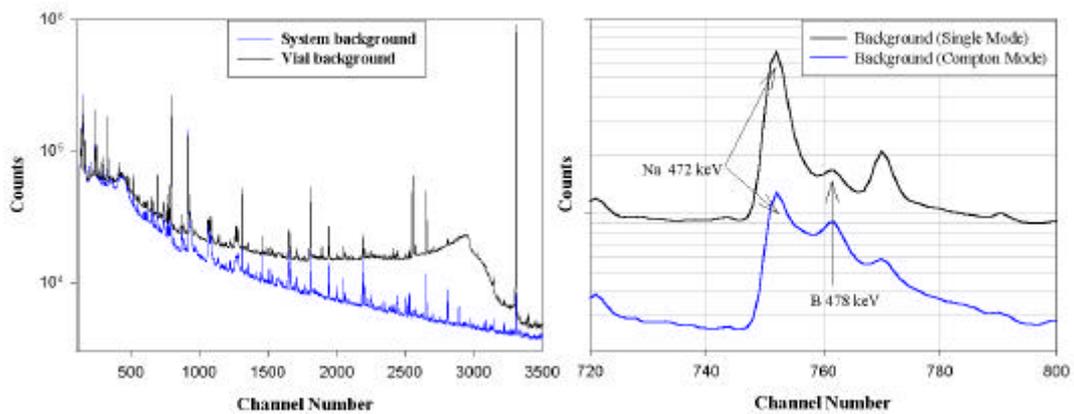


Fig. 3. Comparison of background spectrum and Compton and single mode.

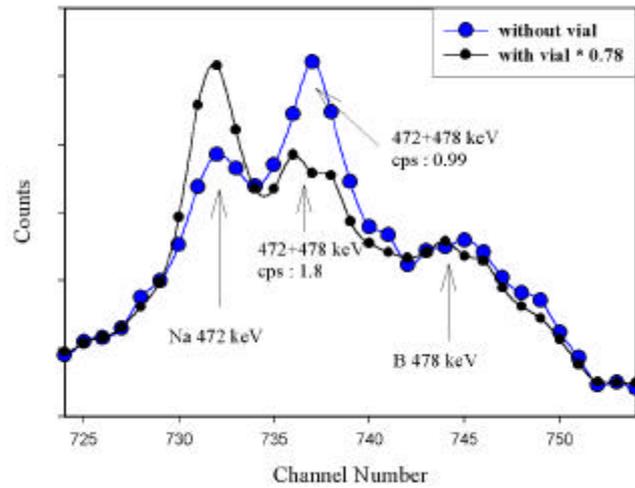
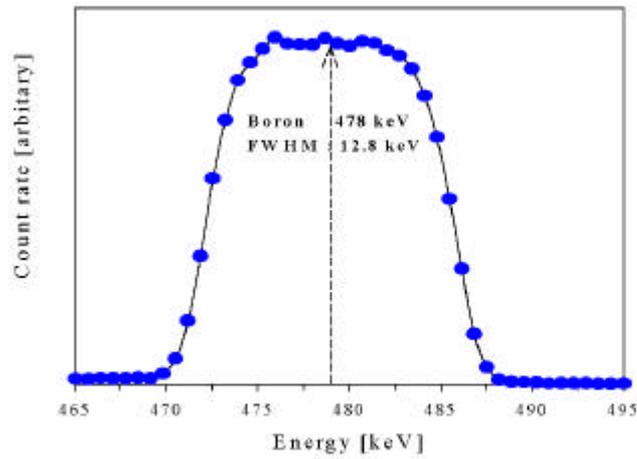


Fig. 5. B.

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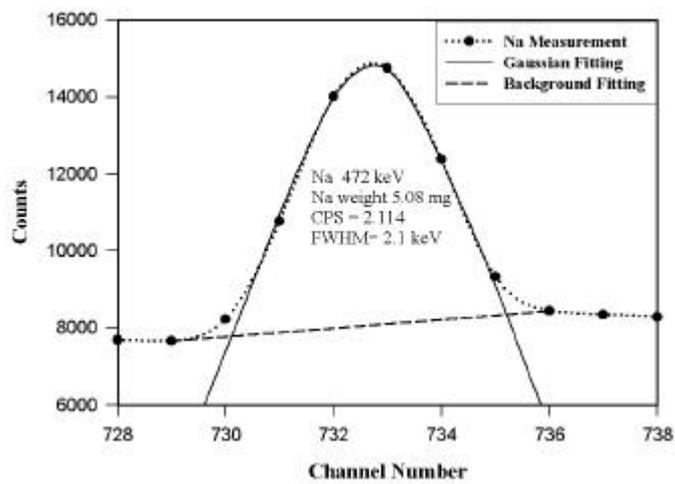


Fig. 6. Gaussian fitting from Prompt gamma-ray spectrum of Na.

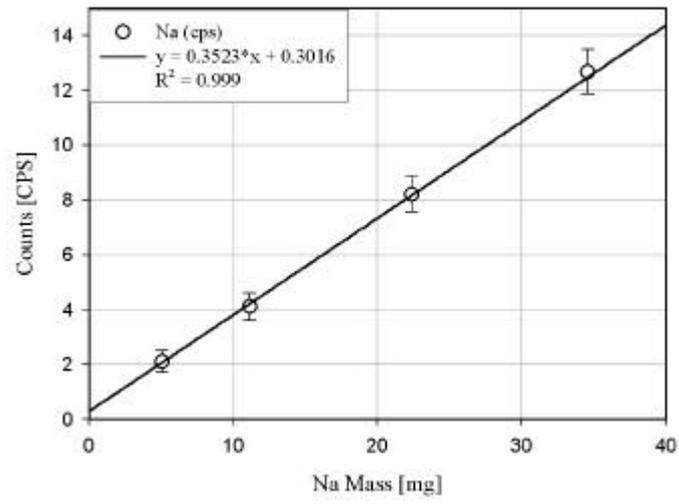


Fig. 7. Calibration curves between Na mass and counts(cps).