GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. G-41-617 (R5842-OAD) GTRI/~~GIT~~ DATE 10 / 30 / 84

Project Director: R. A. Young School/~~GIT~~ Physics

Sponsor: ~~Freeport~~ ENGELHARD Kaolin Company

Type Agreement: P. O. #P-0046

Award Period: From 10/1/84 To ~~12/31/84~~ OPEN (Performance) 12/31/84 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$ 6,452	$ 6,452
Funded:	$ ~~6,452~~ 12/31/87	$ 6,452

Cost Sharing Amount: $ N/A Cost Sharing No: _____

Title: Diffraction Studies of Trace Minerals

ADMINISTRATIVE DATA OCA Contact R. Dennis Farmer x-4820

1) Sponsor Technical Contact:

T. R. Drummond
~~Freeport~~ ENGELHARD Kaolin Company
P. O. Box 37
Gordon, GA 31031
(912) 628-7011

2) Sponsor Admin/Contractual Matters:

Ben L. Creamer see Rev #3
Freeport Kaolin Company
P. O. Box 37
Gordon, GA 31031
(912) 628-7136

Defense Priority Rating: _____ Military Security Classification: _____

(or) Company/Industrial Proprietary: N/A

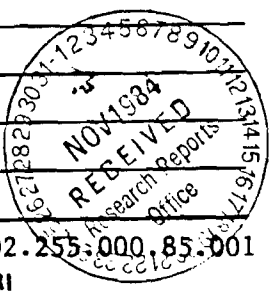
RESTRICTIONS

See Attached _____ Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with none proposed

COMMENTS:



Sponsor ID #02.255.000.85.001

COPIES TO:

Project Director	Procurement/EES Supply Services	GTRI
Research Administrative Network	Research Security Services	Library
Research Property Management	Reports Coordinator (OCA)	Project File
Accounting	Research Communications (2)	Other A. Jones

FORM OCA 4-383

12/88

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

*Note: This project was closed out 11/25/86 and re-opene

NOTICE OF PROJECT CLOSEOUT

Date 5/25/89

Project No. G-41-617 Center No. R5844-0A0

Project Director R. A. Young School/Lab Physics

Sponsor Engelhard Corporation

Contract/Grant No. P.O. P-0046 GTRC XX GIT ____

Prime Contract No. ____

Title Diffraction Studies of Trace Minerals

Effective Completion Date 3/31/89 (Performance) N/A (Reports)

Closeout Actions Required:

___ None
X Final Invoice or Copy of Last Invoice
___ Final Report of Inventions and/or Subcontracts- Patent questionnaire sent to PI.
___ Government Property Inventory & Related Certificate
___ Classified Material Certificate
___ Release and Assignment
___ Other ____

Includes Subproject No(s). ____

Subproject Under Main Project No. ____

Continues Project No. ____ Continued by Project No. ____

Distribution:

X Project Director
X Administrative Network
X Accounting
X Procurement/GTRI Supply Services
X Research Property Management
__ Research Security Services

X Reports Coordinator (OCA)
X GTRC
X Project File
2 Contract Support Division (OCA)
___ Other ____

Georgia Institute of Technology
Atlanta, Georgia 30332

College of Sciences and Liberal Studies
School of Physics
24 January 1985

Mr. Paul Sennett
Director of Research and Development
Freeport Kaolin Company
P. O. Box 337
Gordon, GA 31031

Ref: P-0046
Project G41-617
"Diffraction Studies of Trace Minerals"
1 October 1984-31 December 1984

Dear Paul,

Although this project was supposed to start on 1 October 1984 and monthly letter progress reports were to be rendered, no previous report has been rendered because of the uncertainties and delays occasioned by the departure of Catherine Dentan and the apparent difficulty at Freeport in getting someone to replace her as the one permanently in charge of the project at Freeport. As one consequence, we have not received from Freeport any samples other than those that Catherine left with us last July.

Last fall, you told us to go ahead and start with two of the samples that she had left. Since time was available on the diffractometer and no other specimens have been supplied as yet by Freeport, we have in fact examined all six of those that she left: GF122W, GF122FINE, BF122W, BF122FINE, MT MILLED and MIXED LAYER.

Attached are reduced-size xerox copies of our diffractometer traces from 5-32° (2θ) made with copper Kα radiation. As you see, and as I believe Hans Neubold remarked when you visited last, the general impression is that the quality of the data is very high. That correct impression is ascribable to the fact that we have used a step-scan mode with rather small steps and relatively long times spent accumulating counts at each step.

In Figures 2-6 the b figure was produced from the same data used for the a figure by a 5X computer expansion of the vertical scale. Because of the noise, very little more is seen in the expanded figures than in the original. However, it may be possible to see more in the expanded pattern if we first did something like 4-point computer smoothing of the data. We have not yet tried that. For example, such smoothing in the expanded pattern might make it clearer whether the possible small amounts of montmorillinite and mica are actually present and, if so, in what degree the amounts differ from sample to sample.

At first glance it seems that the amount of montmorillinite in GF122FINE may be greater than that in GF122W while the converse is true for the mica content. It does seem relatively clear that there is more anatase in GF122W than in GF122FINE.

It also appears that the amount of layer faulting is greater in the FINE fraction than in the whole fraction of GF122. One might like to check that by running other diffraction patterns of separately packed specimens of the same materials. Again, in BF122 it appears that the amount of layer faulting (lack of "degree of crystal energy") is slightly greater in the FINE fraction than in the whole material.

In both GF122 and BF122 the 00ℓ lines are sharper in the W material than in the FINE fraction. This may be associated more with the greater amount of layer faulting in the FINE fraction than with the reduction in average particle size. As you know, one of the faults that various workers have attempted to model for layer-faulted kaolinite is a variation in the spacing between layers. That is not from any intercalated species but simply from the faults in the kaolinite itself.

In the MIXED LAYER material, it is obvious that there is considerable montmorillinite present and some anatase. Anatase is more obvious in this pattern (Figure 5) than in that of the 122 patterns, largely because the kaolinite 00ℓ peaks are so very sharp--probably approaching instrumental resolution. It is interesting that these kaolinite peaks are so sharp, since the kaolinite in this material is also "poorly crystallized", approximately as much so as are either BF122FINE or GF122FINE, the two specimens which show the broadest 00ℓ kaolinite peaks.

In the MT MILLED specimen, we see many things besides kaolinite. In fact the strongest peak present seems to belong to muscovite. Of possible particular interest for this specimen is the fact that two polymorphs of muscovite, 3T and 2M, were present. Also, probably present are quartz and a small amount of anatase. It may be of interest to note that the 003 muscovite 3T line at about 9° is sharper than the 001 kaolinite line at just over 12°. That suggests very good stacking of the muscovite in the c^* direction.

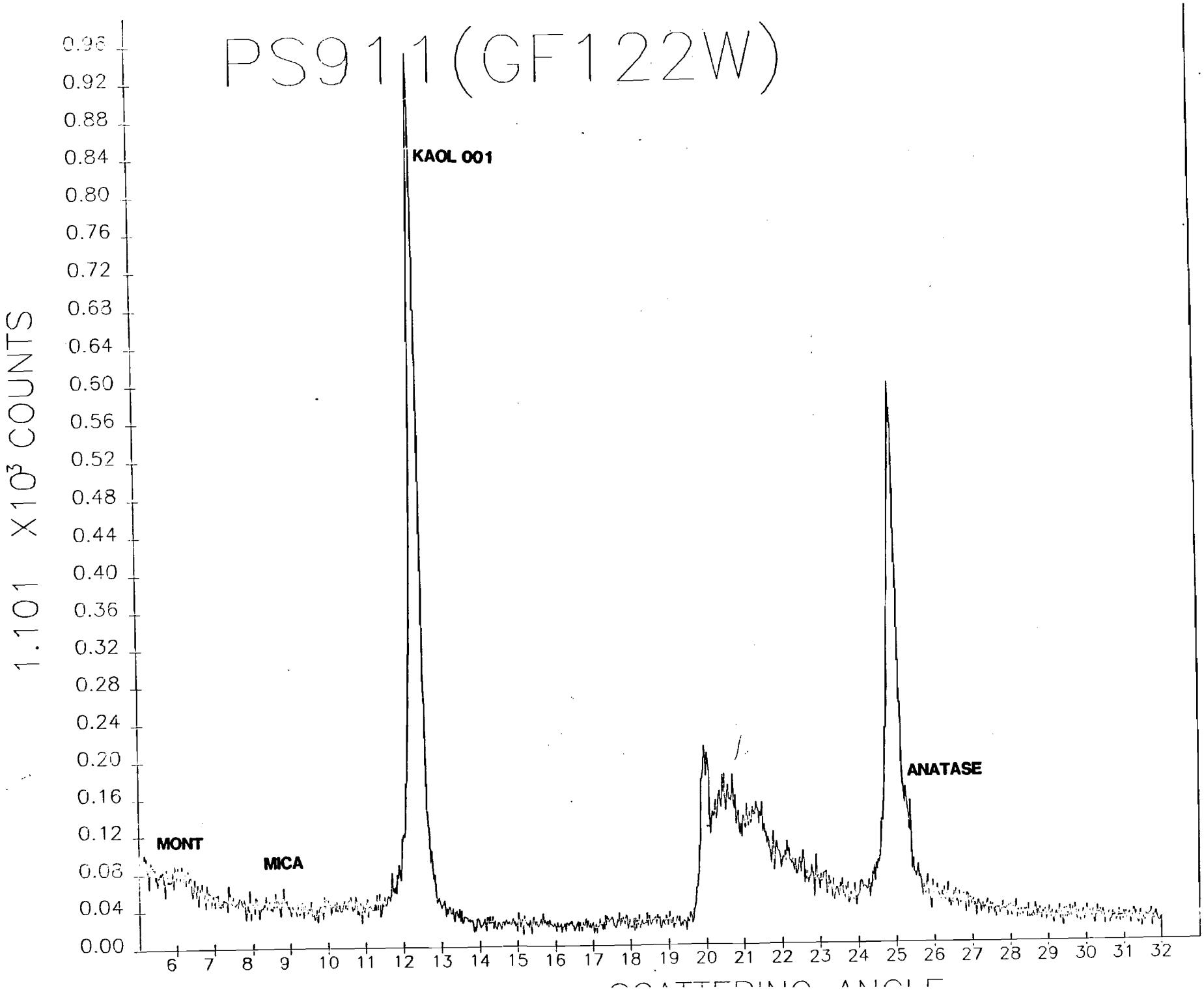
We hope you will find these results interesting, and that some of them may be of possible use to you.

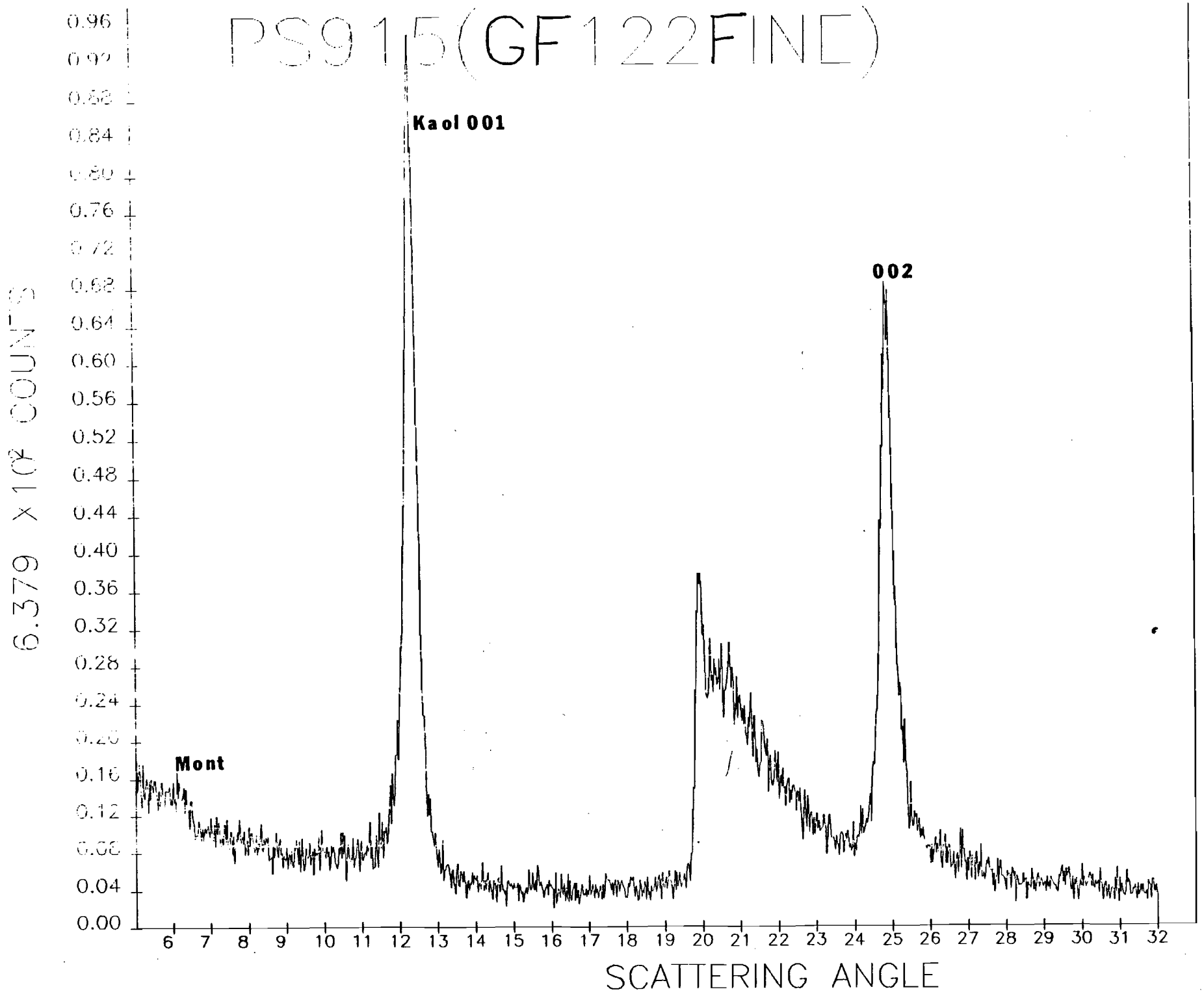
Although we have not received any additional samples from you, it is not a problem to us at the moment; Paul Suitch, who does most of the work, has had to drop out of school for this quarter and go to New Jersey because of his father's grave illness. He may not be able to return to Atlanta until the end of March.

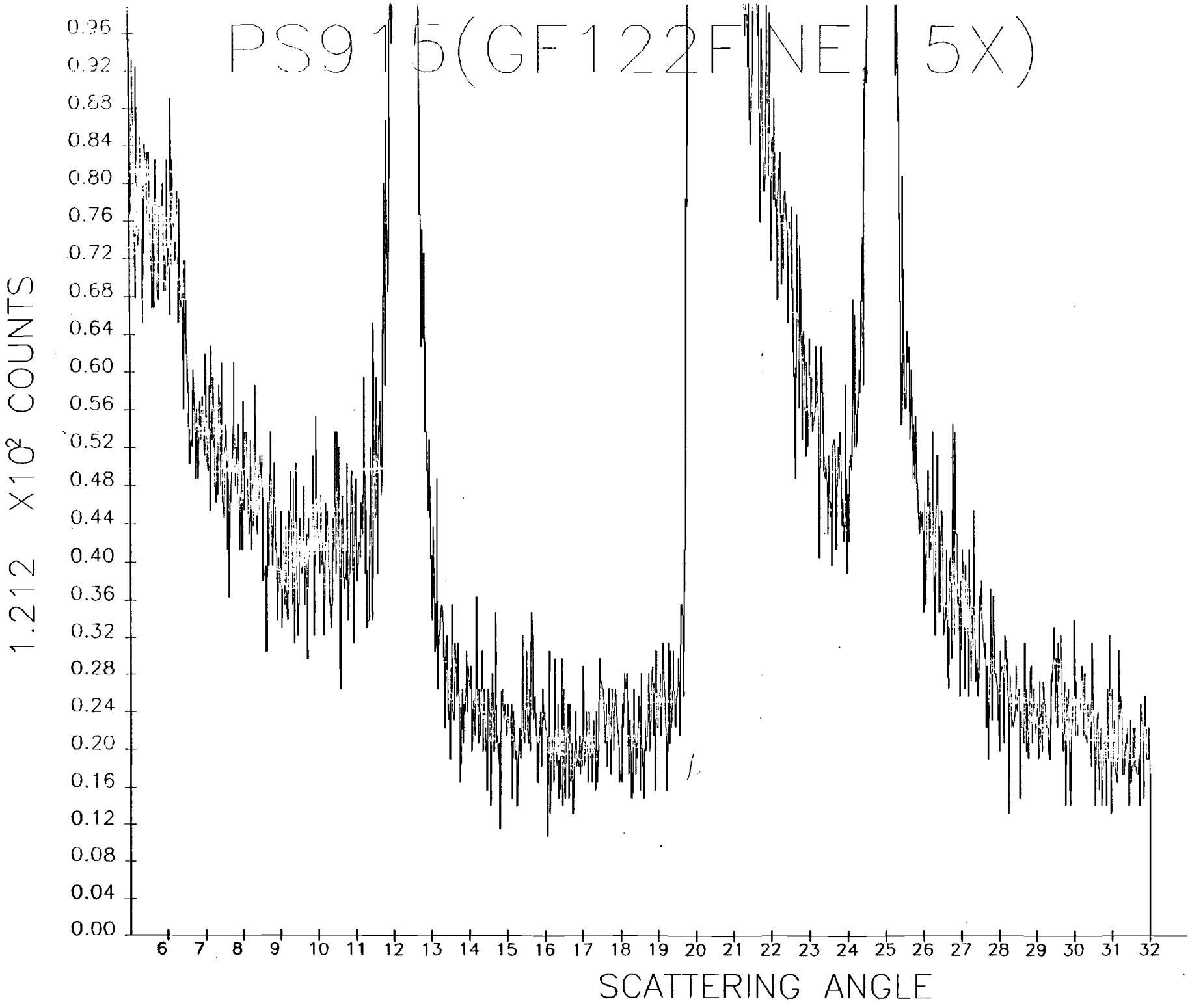
Sincerely,

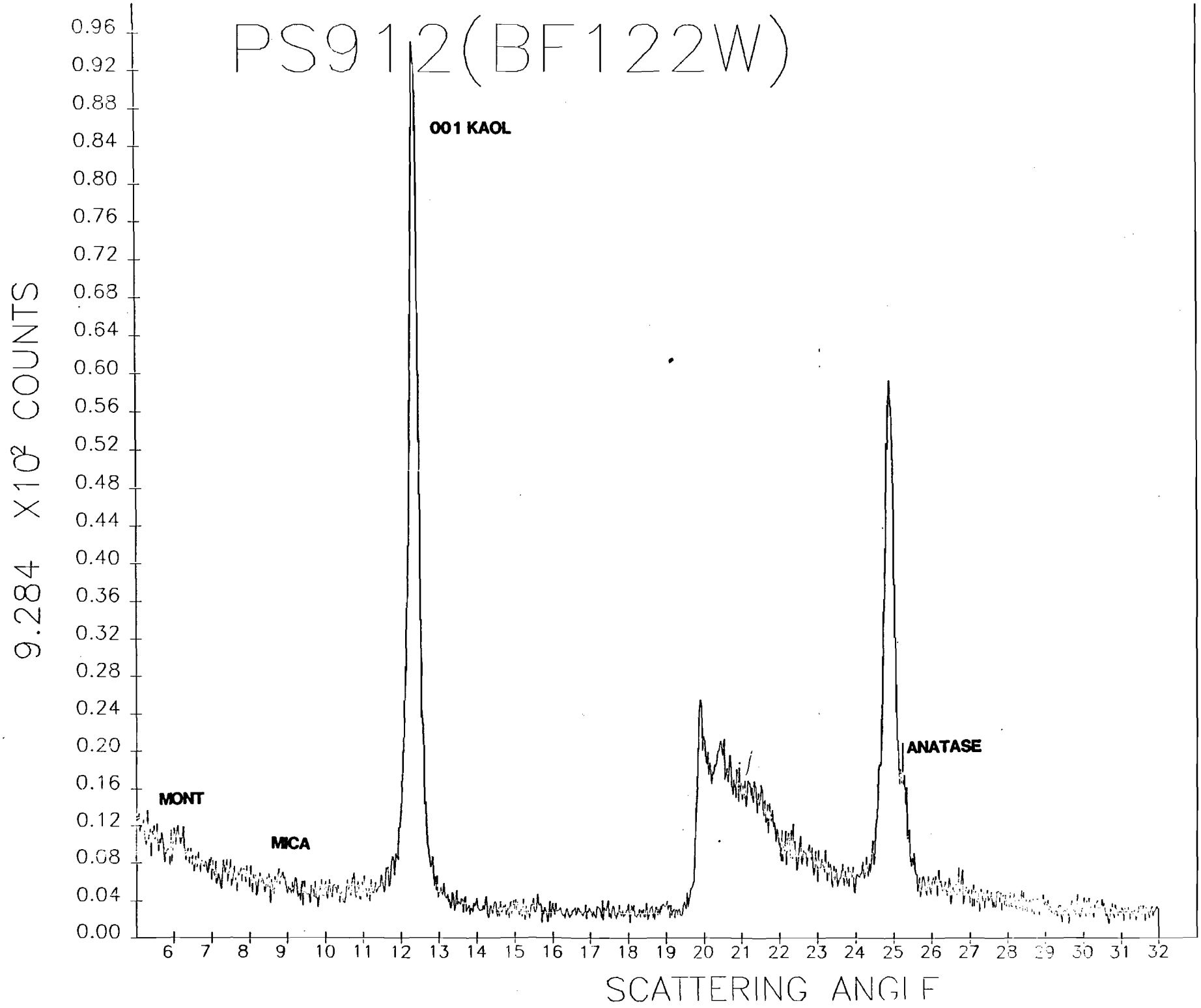
R. A. Young,
Professor

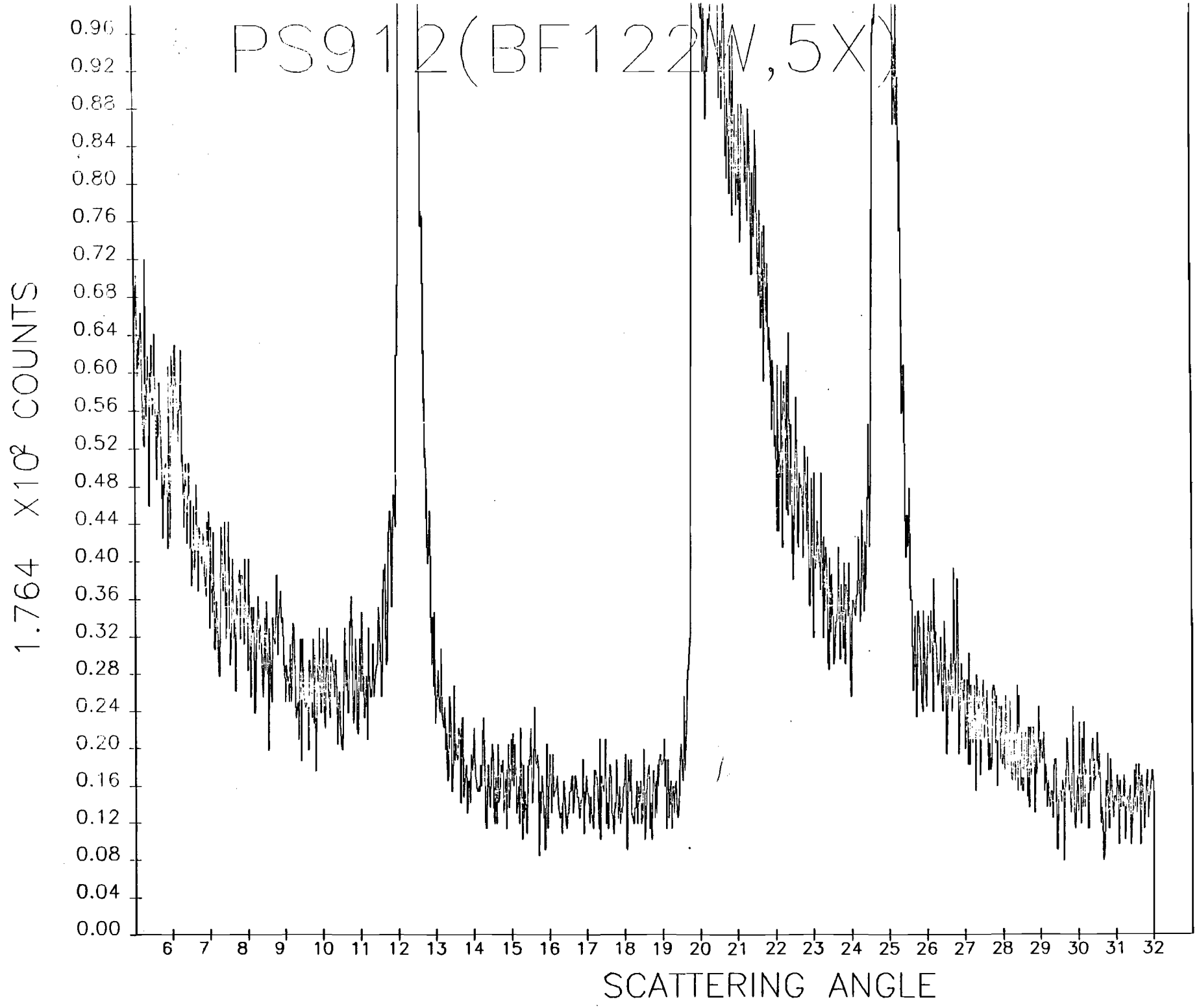
RY:rg
Encl.
xc: Paul Suitch w/encl.

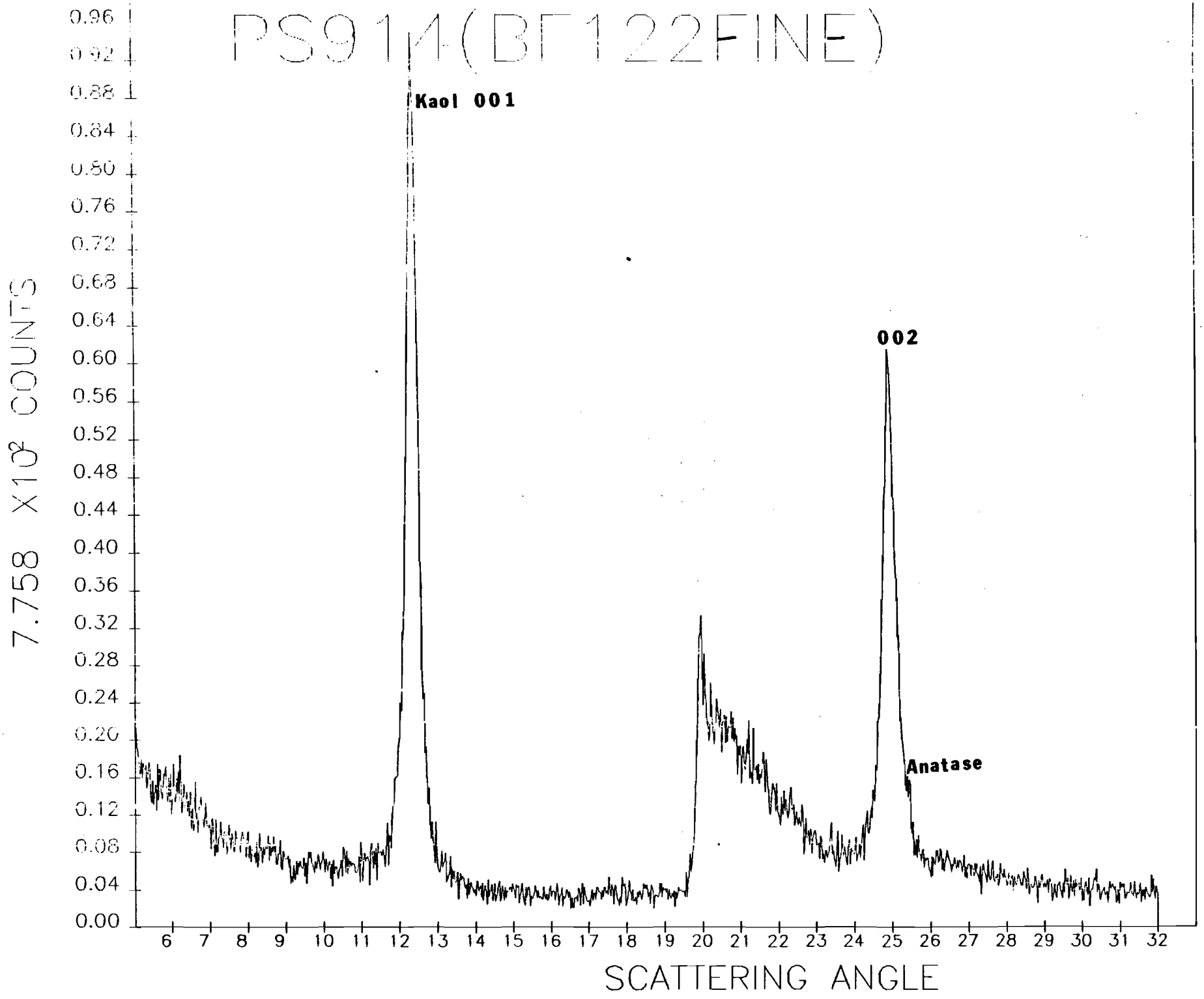

PS911(GF122W)
1.101 X10³ COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.63
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
KAOL 001
MONT
MICA
ANATASE
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE

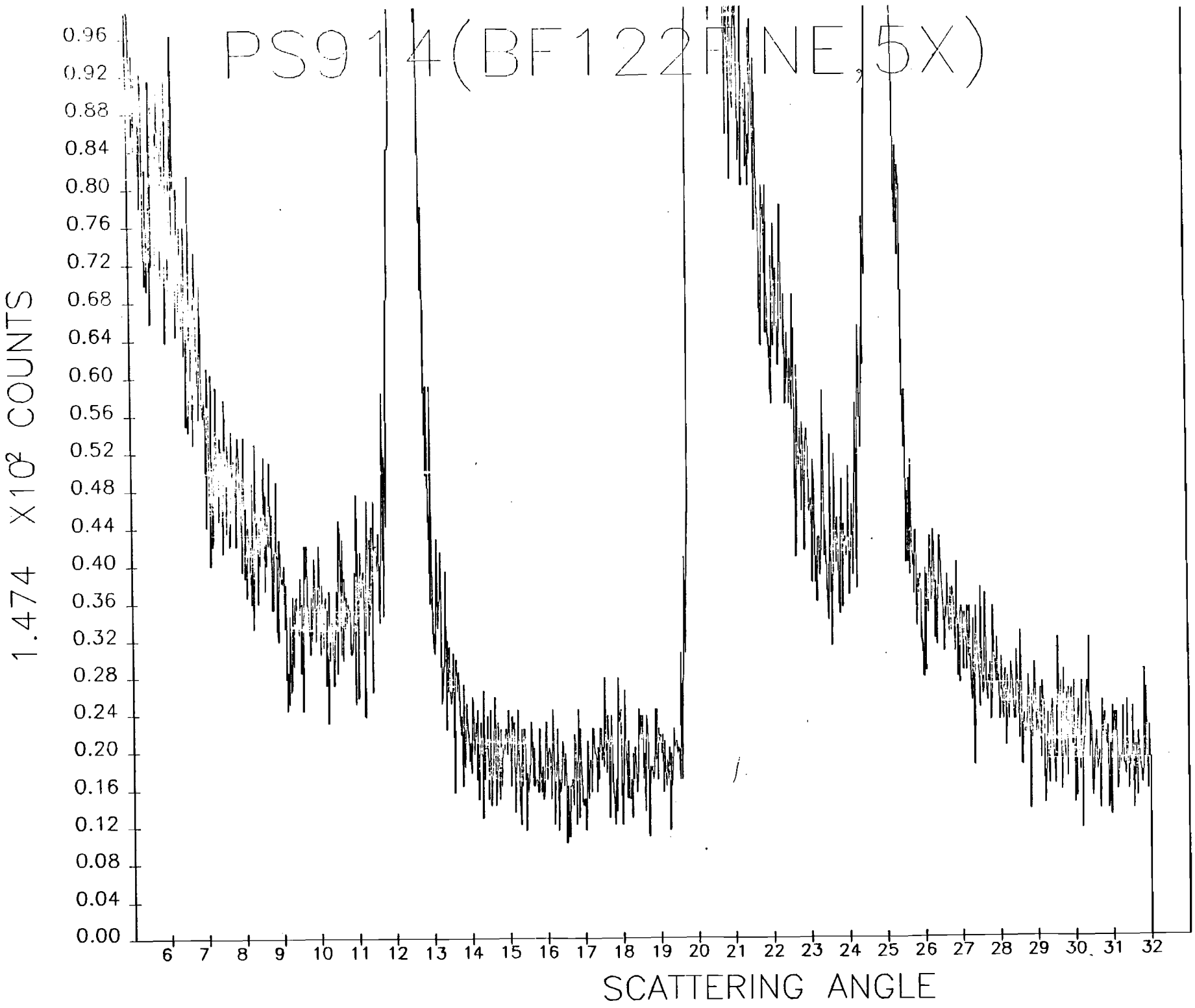

PS915(GF122FIND)
Kaol 001
002
Mont
6.379 X10² COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE

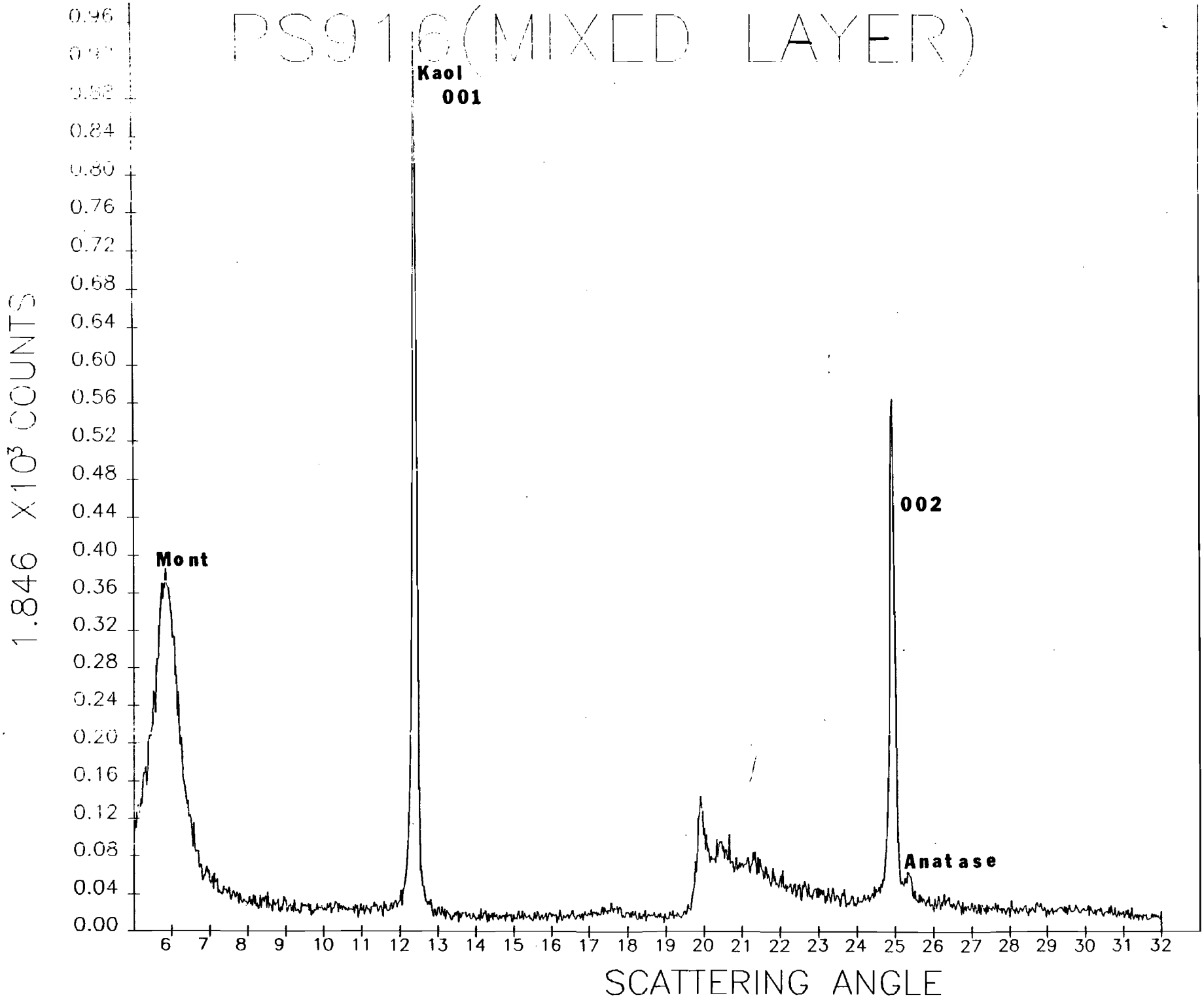

PS915(GF122FINE | 5X)
1.212 X10² COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE

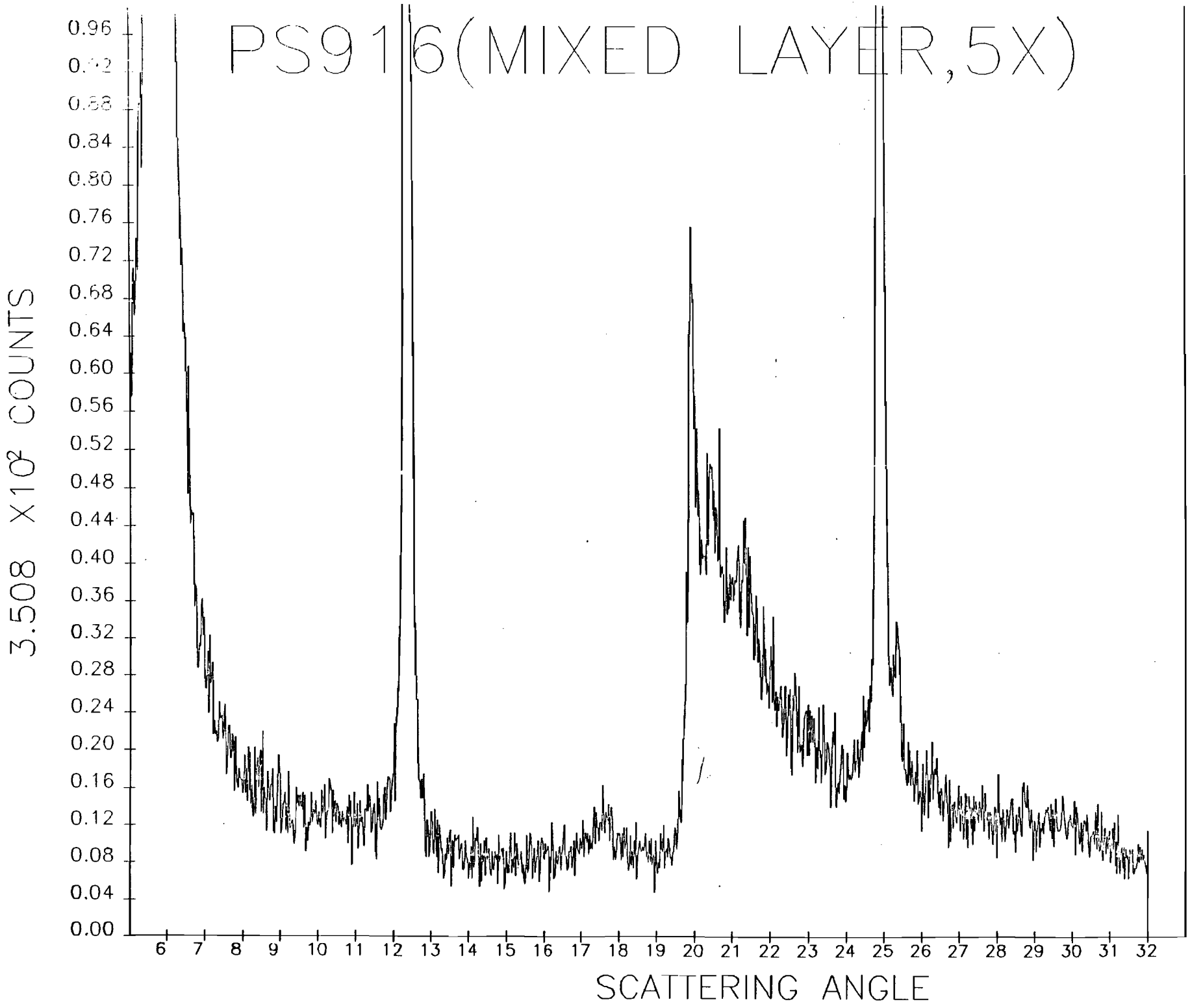

PS912(BF122W)
001 KAOL
MONT
MICA
ANATASE
9.284 X10² COUNTS
SCATTERING ANGLE
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

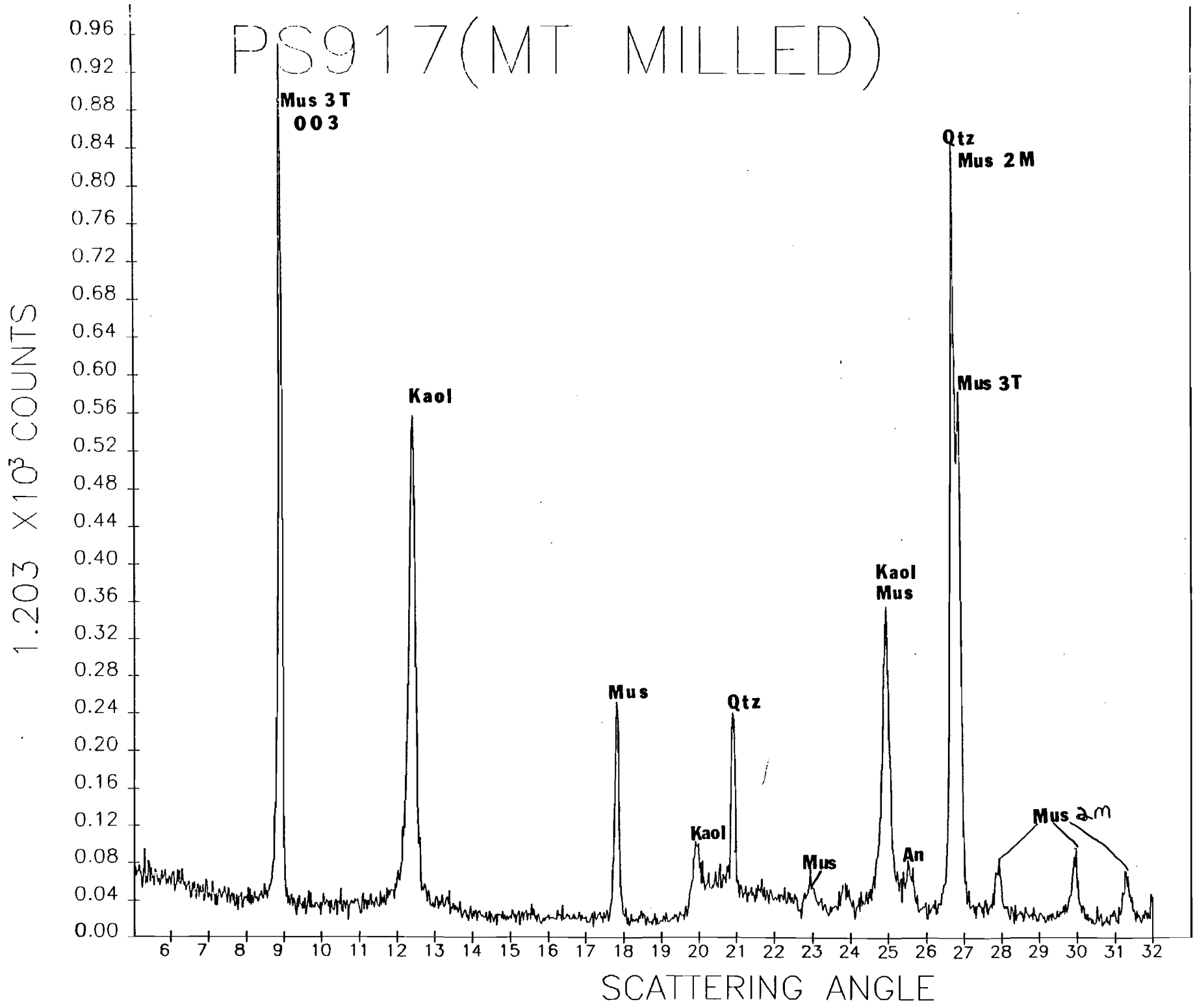

PS912(BF122W,5X)
1.764 X10² COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE

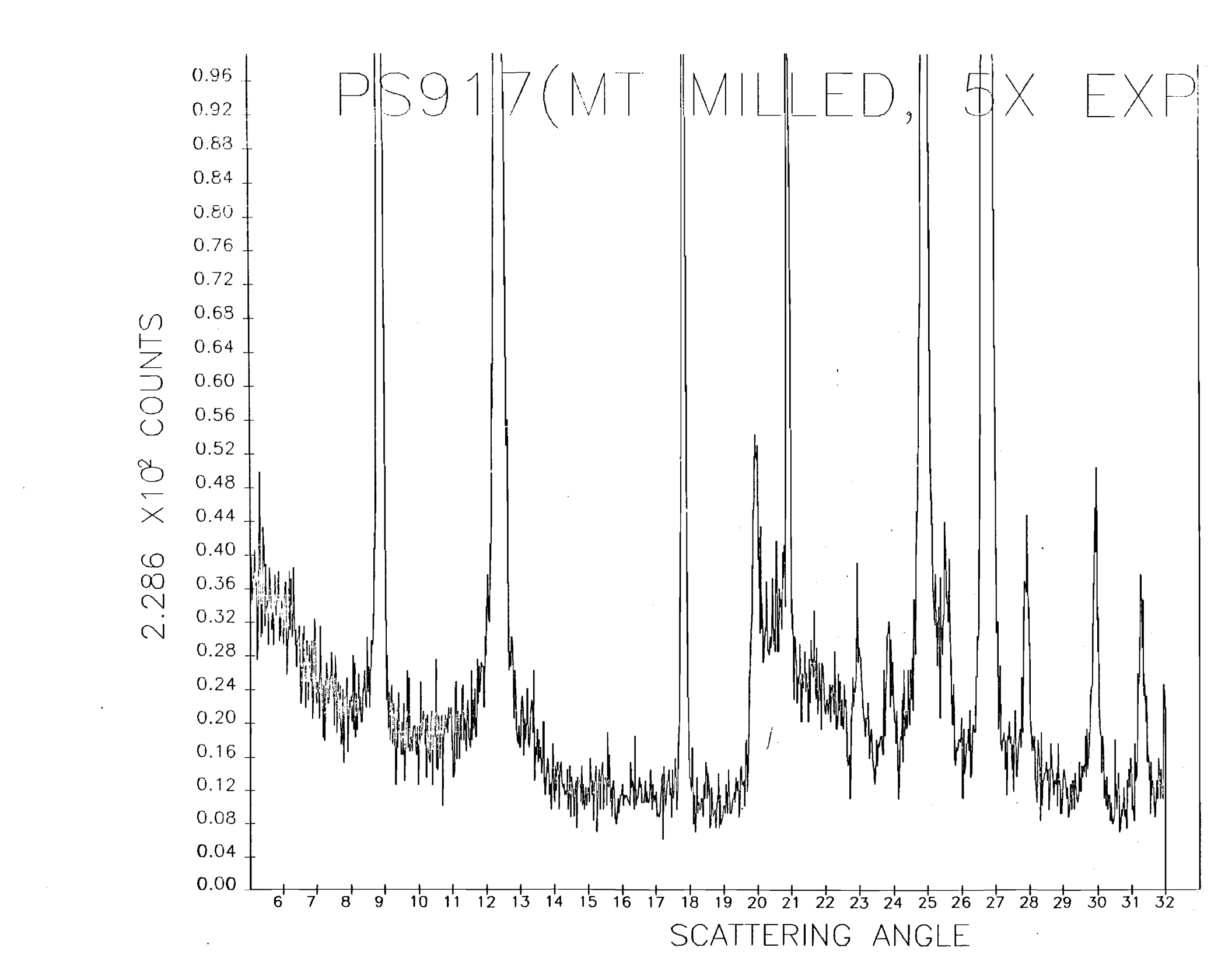

PS914(BT122FINE)
Kaol 001
002
Anatase
7.758 X10² COUNTS
SCATTERING ANGLE
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32


PS914(BF122PINE,5X)
1.474 X10² COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE


PS916(MIXED LAYER)
Kaol
001
002
Mont
Anatase
1.846 X10³ COUNTS
SCATTERING ANGLE
0.96
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32


PS916(MIXED LAYER,5X)
3.508 X10² COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE


PS917(MT MILLED)
Mus 3T
003
Kaol
Mus
Qtz
Kaol
Mus
Kaol
Mus
An
Qtz
Mus 2M
Mus 3T
Mus 2M
1.203 X10³ COUNTS
SCATTERING ANGLE
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32


PS917(MT MILLED, 5X EXP
2.286 X10² COUNTS
0.96
0.92
0.88
0.84
0.80
0.76
0.72
0.68
0.64
0.60
0.56
0.52
0.48
0.44
0.40
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
SCATTERING ANGLE