

JAERI 4043

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JAERI 4043

INDC-296  
INDC(JAP)-24

Bibliography  
for  
Thermal Neutron Scattering

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March 1968

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日本原子力研究所

Japan Atomic Energy Research Institute

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## Bibliography for Thermal Neutron Scattering

### Summary

The Thermalization Group of the Japanese Nuclear Data Committee has collected literatures on measurements and calculations of thermal neutron scattering cross sections and basic studies of lattice dynamics, liquid and molecular dynamics. These references are needed for the data evaluation which is one of the main activities of the Committee. This report is a list of the references classified by kinds of material, which are collected by group members up to now.

October, 1967

The Thermalization Group\*  
Japanese Nuclear Data Committee

## 熱中性子散乱文献集

### 要旨

シグマ委員会の熱化グループでは熱中性子の散乱断面積の測定および計算、あるいはそれに関連ある格子振動、液体および分子運動の基礎的研究についての文献を集めている。これらの文献は委員会の主な活動の一つである核データーの評価に必要とされる。この報告は今までグループ員により集められた文献を物質別に分類した文献集である。

1967年10月

シグマ委員会熱化グループ\*\*

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## Bibliography for Thermal Neutron Scattering

### 1. General Description

The thermalization Group of the Japanese Nuclear Data Committee has performed the collection of references and calculations of the thermal neutron scattering cross sections. In addition, the fundamental researches of lattice dynamics, liquid and molecular dynamics are also collected, in so far as they are concerned with the thermal neutron scattering. These references are needed for the data evaluation which is one of the main activities of the Committee. Collection of relative information is first made by Reader who are members and are assigned to read specific literatures, using Data Sheets which are characterized by;

1. Authors
2. Reference
3. Title
4. Laboratory
5. Materials
6. Range of neutron energy and scattering angle
7. Temperature
8. Method
9. Results and key words

This report is a list of Authors, Titles and References classified by kinds of materials, which are extracted from the above sheets.

Reference sources coverde include as many journals, conference proceedings, report series and books in concern with thermal neutron inelastic scattering as possible to obtain in the country and from abroad.

Although collection is intended to be perfect, they may be incomplete and need to be revised. References which have been left out concern elastic and inelastic scattering of thermal neutron in magnetic systems.

### 2. Remarks

1. References in this list are classified by kinds of materials. Thus when any one reference reports on a number of materials, it is listed for each material individually. The international chemical symbols are adopted for indication of the materials, excepting some chemical compounds and general articles which are easily indentified by the simple abbreviation of English names.
2. Classification number is indicated by using five (5) digit numbers. First tow digits show the year and the last three indicate serial number for each material.
3. Names of Authors are spelled in English.
4. Titles are also spelled in English. When a reference is written in other language, it is translated into English.
5. Reference abbreviations follow Journal Abbreviations of the Nuclear Science Abstracts. Books and conference proceedings are indicated by full titles, publisher and years, except the following two proceeding ;
  - i) Inelastic Scattering of Neutrons in Solid and Liquid, IAEA, Vienna.....ISNSL.
  - ii) Inelastic Scattering of Neutrons IAEA, Vienna.....ISN.

### 3. Further Revision

This documentation activity will be continued in future. A revised edition is scheduled to be published once a year.

Editors      M. SAKAMOTO  
                  M. ITZUMI

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4. D <sub>2</sub> O	Heavy Water .....	15
5. HF	Hydrogen Fluoride .....	17
6. BeO	Beryllium Oxide .....	17
7. CO <sub>2</sub>	Carbon Dioxide .....	17
8. NH <sub>4</sub> NO <sub>3</sub>	Ammonium Nitrate .....	17
9. NH <sub>4</sub> F	Ammonium Fluoride .....	17
10. NH <sub>4</sub> Cl	Ammonium Chloride .....	17
11. NH <sub>4</sub> I	Ammonium Iodide .....	18
12. NH <sub>4</sub> Br	Ammonium Bromide .....	18
13. NaI	Sodium Iodide .....	18
14. MgO	Magnesium Oxide .....	18
15. AlN	Alminium Nitride .....	18
16. KH <sub>2</sub> PO <sub>4</sub>	Potassium Dihydrogen Phosphate .....	18
17. KCl	Potassium Chloride .....	18
18. KBr	Potassium Bromide .....	18
19. KI	Potassium Iodide .....	18
20. CaF <sub>2</sub>	Calcium Fluoride .....	18
21. GaAs	Gallium Arsenide .....	18
22. RbI	Rubidium Iodide .....	19
23. SrTiO <sub>3</sub>	Strontium Titanate .....	19
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2. C <sub>2</sub> H <sub>6</sub>	Ethane .....	21
3. C <sub>3</sub> H <sub>8</sub>	Propane .....	21
4. C <sub>5</sub> H <sub>12</sub>	Pentane .....	21
5. C <sub>6</sub> H <sub>6</sub>	Benzen .....	21
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7. C <sub>18</sub> H <sub>14</sub>	Terphenyle .....	22
8. C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	Glycerol .....	22
9. BPHYL	Biphylic .....	22
10. PLYETH	Polyethylene .....	22
11. PARFN	Paraffine .....	24
12. ALCHL	Alcohol .....	24
13. CH <sub>3</sub> I	Methyl Iodide .....	24
14. ORG	Other Organic Molecules .....	24
 4. Monatomic Elements .....		25
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1. He	Helium .....	25
2. Li	Lithium .....	25
3. Fe	Beryllium .....	25
4. DIMND	Diamond .....	26
5. GRPHT	Graphite .....	26
6. Ne	Neon .....	28
7. Na	Sodium .....	28
8. Mg	Magnesium .....	28
9. Al	Aluminium .....	29
10. Si	Silicon .....	30
11. Ar	Argon .....	30
12. K	Potassium .....	30
13. Ti	Titanium .....	30
14. V	Vanadium .....	31
15. Cr	Chromium .....	31
16. Fe	Iron .....	31
17. Ni	Nickel .....	31
18. Cu	Copper .....	32
19. Zn	Zinc .....	32
20. Ge	Germanium .....	32
21. Br	Bromine .....	33
22. Kr	Kripton .....	33
23. Nb	Niobium .....	33
24. Mo	Molybdenum .....	33
25. Pd	Palladium .....	33
26. Sn	Tin .....	34
27. Te	Tellurium .....	34
28. Ta	Tantal .....	34
29. W	Tungsten .....	34
30. Au	Gold .....	35

31. Pb	Lead .....	35
32. Bi	Bismuth .....	35
33. U	Uranium .....	35
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2. NaH	Sodium Hydride .....	36
3. AlThH	Aluminium-Thorium Hydride .....	36
4. CaH	Calcium Hydride .....	36
5. TiH	Titanium Hydride .....	36
6. TiZr	Titanium-Zirconium .....	36
7. VH	Vanadium Hydride.....	36
8. CrW	Chromium-Tungsten .....	36
9. MnCo	Manganese-Cobalt .....	36
10. NiPb	Nickel-Palladium.....	37
11. CuZn	Copper-Zinc .....	37
12. CuAu	Copper-Gold .....	37
13. ZrH	Zirconium Hydride .....	37
14. NbH	Niobium Hydride .....	38
15. NbMo	Niobium-Molybdenum .....	38
16. PdH	Palladium Hydride .....	38

## 1 General Articles

### 1.1. Review Articles

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The Neutron-Phonon Interaction in Solids  
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ISNSL, Vol. 1, 189 (1963)

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ISNSL, Vol. 2, 3 (1963)

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Research with Inelastic Neutron Scattering at the NRU  
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PICG, Vol. 7, 419 (1965)

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Space-Time Correlation Function Formalism for Slow Neutron Scattering

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ISNSL, Vol. 2, 237 (1963)

**2.10 Ammonium Chloride****NH<sub>4</sub>Cl-61001**

A. D. B. WOODS, B. N. BROCKHOUSE, M. SAKAMOTO, R. N. SINCLAIR

Energy Distributions of Neutrons Scattered from Graphite, H<sub>2</sub>O, D<sub>2</sub>O, Ice, ZrH<sub>1.8</sub>, LiH, NaH, NH<sub>4</sub>Cl, by Beryllium Detector Method

ISNSL, 487 (1961)

**NH<sub>4</sub>Cl-63002**

G. VENKATARAMAN, K. USHA, P. K. IYENGER

Study of Ammonium Halides by Neutron Spectrometry

ISNSL, Vol. 2, 253 (1963)

**NH<sub>4</sub>Cl-63003**

K. MIKKE, A. KROH

Lattice Dynamics of Some Ammonium Salts by Inverted Filter Method

ISNSL, Vol. 2, 237 (1963)

**NH<sub>4</sub>Cl-66004**

B. BROCKER

Total Neutron Cross Section Measurement in Hydrogenous Compounds

EANDC(E) 66 "U" (1966)

**2. 11. Ammonium Iodide****NH<sub>4</sub>I-66001**

G. KOSALY, G. SOLT

Slow Neutron Scattering by Solid CH<sub>4</sub> and NH<sub>4</sub>I*Physica*, 32, 1571 (1966)**NH<sub>4</sub>I-66002**

B. BROCKER

Total Neutron Cross Section Measurement in Hydrogenous Compounds

EANDC(E) 66 "U" (1966)

**NH<sub>4</sub>I-63003**

K. MIKKE, A. KROH

Lattice Dynamics of Some Ammonium Salts by Inverted Filter Method

ISNSL, Vol. 2, 237 (1963)

**2. 12. Ammonium Bromide****NH<sub>4</sub>Br-63001**

G. VENKATARAMAN, K. USHA, P. K. IYENGER

Study of Ammonium Halides by Neutron Spectrometry

ISNSL, Vol. 2, 253 (1963)

**NH<sub>4</sub>Br-63002**

K. MIKKE, A. KROH

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**2. 13. Sodium Iodide****NaI-60001**

A. D. B. Woods, W. COCHRAN, B. N. BROCKHOUSE

Lattice Dynamics of Alkali Halide Crystal

*Phys. Rev.*, 119, 980 (1960)**NaI-63002**

A. D. B. Woods, B. N. BROCKHOUSE, R. A. COWLEY, W. COCHRAN

Lattice Dynamics of Alkali Halide Crystals II. Experimental Studies of KBr and NaI

*Phys. Rev.*, 131, 1025 (1963)**2. 14. Magnesium Oxide****MgO-65001**

G. PECKHAM

Phonon Dispersion Relations in Magnesium Oxide  
"Lattice Dynamics" (ed. by B. F. WALLIS) 49 (1965),  
Pergamon Press**MgO-67002**

G. PECKHAM

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*Proc. Phys.*, 90, 657 (1967)**2. 15. Aluminium Nitride****AlN-67001**

A. T. COLLINS, E. C. LICHETWELL, P. J. DEAN

Lattice Vibration Spectra of Aluminum Nitride  
*Phys. Rev.*, 158, 833 (1967)**2. 16. Potassium Dihydrogen Phosphate****KH<sub>2</sub>PO<sub>4</sub>-63001**

H. PALEVSKY, K. OTNES, Y. WAKUTA

Low Frequency Hydrogen Vibrations in Potassium Dihydrogen Phosphate  
ISNSL, Vol. 2, 273 (1963)**2. 17. Potassium Chloride****KCl-67001**

V. I. STARTSEV, I. V. BRAUDE

The Dispersion of Elastic Oscillation in the Crystal Lattice of Potassium Chloride, as Determined from the Diffusive X-ray Scattering

*Doklady Akademii Nauk*, 172 (5), 1053 (1967)**2. 18. Potassium Bromide****KBr-63001**

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Normal Vibrations of Potassium Iodide

*Phys. Rev.*, 147, 577 (1966) 577**2. 20. Calcium Fluoride****CaF<sub>2</sub>-63001**

D. CRIBIER, B. FARNOUX, B. JACROT

Frequency of Optical Vibrations in Fluorite CaF<sub>2</sub>

ISNSL, Vol. 2, 225 (1963)

**2. 21. Gallium Arsenide****GaAs-63001**

J. L. T. WAUGH, G. DOLLING

Crystal Dynamics of Gallium Arsenide

*Phys. Rev.* 132, 2410 (1963)

**GaAs-65002**

G. DOLLING, J. L. T. WAUGH

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"Lattice Dynamics" (ed. by R. F. WALLIS), 19 (1965),  
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Lattice Dynamics of Rubidium Iodide in Relation to the  
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R. A. COWLEY

Temperature Dependence of a Transverse Optic Mode  
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R. A. COWLEY

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Inelastic Neutron Spectra from Ferro-Electric and Para-  
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*Soviet Phys.-Solid State*, 8, 2156 (1967)**2.25. Lanthanum Chloride****LaCl<sub>3</sub>-65001**

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and Subthermal Neutrons  
AE-222 (1966)**2.28. Uranium Dioxide****UO<sub>2</sub>-63001**

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ISNSL, Vol. 2, 213 (1963)

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The Crystal Dynamics of Uranium Dioxide

*Cand. J. Phys.*, 43, 1397 (1965)**UO<sub>2</sub>-65003**

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**UO<sub>2</sub>-66004**

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(Conference on Neutron Cross Section Technology)

### 3 Organic Molecules

#### 3.1. Methan

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*Phys. Rev.*, **76**, 1750 (1949)

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T. J. KRIEGER, M. S. NELKIN  
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*Phys. Rev.*, **106**, 290 (1957)

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*Phys. Rev.*, **124**, 1489 (1961)

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*Physica*, **29**, 491 (1963)

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S. HAUTECLER, H. STILLER  
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The Inelastic Scattering of Cold Neutrons by Methane, Ammonia and Hydrogen  
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H. STILLER, S. HAUTECLER  
 Energy Distribution of Neutrons Scattered from Solid Methane  
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*Nuclear Sci. and Eng.*, **18**, 182~188 (1964)

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 IDO-17087 (1965)

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 Coherent Scattering from CD<sub>4</sub> Gas  
 WASH-1068 (EANDC (VS) 85D) (1966)

**CH<sub>4</sub>-66021**

Y. D. HARKER  
 Solid Methane  
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**CH<sub>4</sub>-66022**

G. KOSALY, G. SOLT  
 Slow Neutron Scattering by Solid CH<sub>4</sub> and NH<sub>4</sub>I  
*Physica*, **32**, 1571 (1966)

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 Scattering Cross Sections with Exact Averaging over  
 Molecular Orientation  
 IDO-17087 (1965)

**3.3. Propane****C<sub>3</sub>H<sub>8</sub>-62001**

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 Scattering of Slow Neutrons from Propane Gas  
*Phys. Rev.*, **125**, 933 (1962)

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R. M. BRUGGER  
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H. L. McMURRY  
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*Phys. Fluids*, **2**, 87 (1959)

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 by Cold Neutron Scattering  
*Physica*, **30**, 1561 (1964)

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 Proton Motions in Complex Hydrogenous Liquids II,  
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*Phys. Rev.*, **151**, 126 (1966)

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 Slow Neutron Scattering by Benzen  
 ISNSL, Vol. 1, 285 (1963)

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 Recent Measurements of the Scattering Laws of Some  
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 ISN, Vol. 2, 167 (1965)

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W. GLÄSER  
 Determination of the Scattering Laws of Some Organic  
 Substances with Slow Neutrons  
*Nukleonik*, **7**, 64 (1965)

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 Slow Neutron Scattering in Water and Some Organic  
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 ISN, Vol. 2, 201 (1965)

**C<sub>6</sub>H<sub>6</sub>-65006**

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 Cold Neutron Scattering by Polyphenyls (Russian)  
 ISN, Vol. 2, 221 (1965)

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ISN, Vol. 2, 167 (1965)

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ISN, Vol. 2, 201 (1965)

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*Nuclear Sci. and Eng.*, 20, 236 (1966)

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*J. Chem. Phys.*, 46, 4847 (1967)

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On the Determination of the Diffusion Constants of  $H_2O$  Polyphenyls,  $ZrH_{1.92}$ , and  $D_2O$  by Neutron Single-Scattering Experiment  
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$C_{12}H_{10}$ -65002

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*Nukleonik*, 7, 64 (1965)

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*Nukleonik*, 7, 286 (1965)

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EANDC (E) 66 "U" (1966)

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Scattering of Slow Neutrons by Solid and Liquid Terphenyls  
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$C_{18}H_{14}$ -66003

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Cold Neutron Scattering and Diffusive Motions in Hydrogen Bond Liquids

$C_3H_8O_3$ -63002

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*Physica*, 30, 1561 (1964)

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BPHYL-65001

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Determination of the Scattering Laws of Some Organic Substances with Slow Neutrons  
*Nukleonik*, 7, 64 (1965)

**3.10. Polyethylene**

PLYETH-58001

A. W. McREYNOLDS, M. S. NELKIN, M. N. ROSENBLEUTH, W. L. WHITMORE  
Neutron Thermalization Chemically-bound Hydrogen and Carbon

PICG, Vol. 16, 297 (1958)

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*J. Mol. Spectroscopy*, **9**, 228 (1962)

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*J. Mol. Spectroscopy*, **9**, 261 (1962)

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ISNSL, Vol. 1, 389 (1963)

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Calculation of Thermal Neutron Flux Spectra in a Polyethylene Moderated Medium

*Nuclear Sci. and Eng.*, **16**, 165 (1963)

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H. W.-78288 (1963)

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Study of Low-Frequency Motions in Polyethylene and the Paraffin Hydrocarbons by Neutron Inelastic Scattering

*J. Chem. Phys.*, **40**, 1417 (1964)

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The Energy-Dependent Total Neutron Cross Section of Polyethylene

*Nuclear Sci. and Eng.*, **23**, 192 (1965)

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*J. Chem. Phys.*, **42**, 4299 (1965)

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Study of the Low-Frequency Molecular Motions in Polyethylene and the n-Paraffins by Slow Neutron Inelastic Scattering

ISN, Vol. 2, 407 (1965)

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Polyethylene Double Differential Inelastic Scattering Cross Sections for Epithermal Neutrons

CONF-660303 (Book 1.) (1966)

(Conference on Neutron Cross Section Technology)

#### PLYETH-66012

G. J. KIROUAC, W. E. MOORE, K. W. SEEMANN

Inelastic Scattering Cross Sections for Polyethylene and Water in the Gas Transition Region

*Nuclear Sci. and Eng.*, **25**, 300 (1966)

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J. U. KOPPEL

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GA-7055 (1966)

#### PLYETH-66014

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Integral Neutron Thermalization

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GA-7055 (1966)

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*J. Chem. Phys.*, **44**, 184 (1966)

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*J. Chem. Phys.*, **45**, 3787 (1966)

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Crystal Vibration of Polyethylene

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Heat Capacity of Polyethylene from 25° to 30°K

*J. Chem. Phys.*, **46**, 1388 (1967)

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GA-65021 (1965)

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## W-66003

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Energy Distributions of Neutrons Scattered from Graphite, H<sub>2</sub>O, D<sub>2</sub>O, Ice, ZrH<sub>1.8</sub>, LiH, NaH, NH<sub>4</sub>Cl by Beryllium Detector Method  
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TiZr-63001

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ZrH-61004

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ZrH-62005

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