

5-1-1958

Bibliography of titles of articles in the field of nuclear quadrupole resonance spectroscopy of solids

R. G. Barnes
Iowa State College

Follow this and additional works at: http://lib.dr.iastate.edu/ameslab_iscreports



Part of the [Nuclear Commons](#)

Recommended Citation

Barnes, R. G., "Bibliography of titles of articles in the field of nuclear quadrupole resonance spectroscopy of solids" (1958). *Ames Laboratory ISC Technical Reports*. 197.
http://lib.dr.iastate.edu/ameslab_iscreports/197

This Report is brought to you for free and open access by the Ames Laboratory at Iowa State University Digital Repository. It has been accepted for inclusion in Ames Laboratory ISC Technical Reports by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

Bibliography of titles of articles in the field of nuclear quadrupole resonance spectroscopy of solids

Abstract

This bibliography lists the titles of literature articles in the field of nuclear quadrupole resonance spectroscopy of solids. This field has been taken to include the area of quadrupolar effects in nuclear magnetic resonance as well as the basic area of nuclear quadrupole resonance in zero magnetic field. Articles published not later than January 1, 1958 have been included. Twenty-one journals are represented, and in addition, eleven books which contain chapters or sections dealing with this subject are included.

Disciplines

Nuclear | Physics

UNCLASSIFIED

ISC-1030

UNITED STATES ATOMIC ENERGY COMMISSION

RESEARCH AND DEVELOPMENT REPORT

BIBLIOGRAPHY OF TITLES OF ARTICLES IN THE FIELD OF NUCLEAR
QUADRUPOLE RESONANCE SPECTROSCOPY OF SOLIDS

by

R. G. Barnes

May 1, 1958

Ames Laboratory
at
Iowa State College
F. H. Spedding, Director
Contract W-7405 eng 82

UNCLASSIFIED

This report is distributed according to the category Physics and Mathematics (UC-34), as listed in TID-4500, February 15, 1958.

Legal Notice

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

- A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or
- B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission to the extent that such employee or contractor prepares, handles or distributes, or provides access to, any information pursuant to his employment or contract with the Commission.

Printed in USA. Price \$1.00 . Available from the

Office of Technical Services
U. S. Department of Commerce
Washington 25, D. C.

Bibliography of Titles of Articles in the Field of Nuclear
Quadrupole Resonance Spectroscopy of Solids

R. G. Barnes

INTRODUCTION

This bibliography lists the titles of literature articles in the field of nuclear quadrupole resonance spectroscopy of solids. This field has been taken to include the area of quadrupolar effects in nuclear magnetic resonance as well as the basic area of nuclear quadrupole resonance in zero magnetic field. Articles published not later than January 1, 1958 have been included. Twenty-one journals are represented, and in addition, eleven books which contain chapters or sections dealing with this subject are included.

It is hoped that this list of titles will provide at the same time a bibliography and an over-all impression of the variety of topics in which nuclear quadrupole resonance techniques have proven useful. The relative newness of the field (just ten year old) causes the list to be not excessively long. An index is provided in which every article has been classified under one or more principal topics, although the extent of cross-indexing is by no means comprehensive. The index will at least provide a point of departure for examining the contribution of nuclear quadrupole resonance spectroscopy to a particular topic.

BOOKS

- 1 E. R. Andrew, Nuclear Magnetic Resonance, Cambridge University Press, 1955.
- 2 N. Bloembergen, page 1, Defects in Crystalline Solids, The Physical Society, 1955.
- 3 M. H. Cohen and F. Reif, page 44, Defects in Crystalline Solids, The Physical Society, 1955.
- 4 M. H. Cohen and F. Reif, Chapter 5, Vol. 5, Solid State Physics, Academic Press, 1957.
- 5 T. P. Das and E. L. Hahn, Supplement to Vol. 5, Solid State Physics, Academic Press, 1958.
- 6 W. Gordy, W. V. Smith, and R. F. Trambarulo, Microwave Spectroscopy, John Wiley and Sons, 1953.
- 7 D. J. E. Ingram, Spectroscopy at Radio and Microwave Frequencies, Butterworths Scientific Publications, 1955.
- 8 G. E. Pake, Chapter 1, Vol. 2, Solid State Physics, Academic Press, 1956.
- 9 R. V. Pound, Chapter 2, Vol. 2, Progress in Nuclear Physics, Academic Press, 1952.
- 10 N. F. Ramsey, Nuclear Moments, McGraw-Hill Book Co., 1953.
- 11 C. H. Townes and A. L. Schawlow, Microwave Spectroscopy, McGraw-Hill Book Co., 1955.

LIST OF JOURNALS

- A - Academie des Sciences, Comptes Rendus
- B - Acta Metallurgica
- C - American Chemical Society, Journal
- D - American Journal of Physics
- F - Archives des Sciences
- H - Cahiers de Physique
- I - Canadian Journal of Physics
- J - Faraday Society, Discussions
- K - Faraday Society, Transactions
- L - Helvetica Physica Acta
- M - Journal de Physique et le Radium
- N - Journal of Chemical Physics
- Q - Journal of Physical Chemistry
- S - New York Academy of Sciences, Annals
- T - Onde Electrique
- U - Physica
- V - Physical Review
- W - Physical Society of Japan, Journal
- X - Review of Scientific Instruments
- Y - Science
- Z - Zeitschrift für Physik
- ZA - Project Reports

JOURNAL ARTICLES

Academie des Sciences, Comptes Rendus1951

- A1 Dispositif simplifie pour l'etude de l'absorption paramagnetique nucleaire, R. Gabillard, 232, 324.
- A2 Theorie de la largeur des raies de resonance nucleaire quadrupolaire de Cl^{35} , Y. Ayant, 233, 949.
- A3 Resonance quadrupolaire de Cl^{35} et Cl^{37} dans $p\text{-C}_6\text{H}_4\text{Cl}_2$, M. Buyle-Bodin and D. Dautreppe, 233, 1101.

1952

- A4 Dispositif de detection de la resonance quadrupolaire electrique, M. Buyle-Bodin, 235, 292.

1953

- A5 Resonance nucleaire quadrupolaire de HgCl_2 , A. Bassompierre, 236, 596.
- A6 Resonance nucleaire quadrupolaire de $\text{CH}_2\text{ClCO}_2\text{H}$, A. Bassompierre, 236, 799.
- A7 Etude de la raie de resonance quadrupolaire du p-dichlorobenzene, Y. Ayant and M. Buyle-Bodin, 236, 800.
- A8 Sur la resonance quadrupolaire electrique du chlore dans HgCl_2 , M. Buyle-Bodin and A. Monfils, 236, 1157.
- A9 Theorie de l'elargissement spinmilieu en resonance quadrupolaire, Y. Ayant, 236, 1553.

Academie des Sciences, Comptes Rendus (continued)

- A10 Etude du couplage spin-spin dans la resonance quadrupolaire de l'azote, Y. Ayant, 236, 2232.
- A11 Resonance nucleaire quadrupolaire du bore, A. Bassompierre, 237, 39.

1954

- A12 Sur la resonance quadrupolaire a l'etat solide de l'iode et du bromoforme, H. Benoit and M. Buyle-Bodin, 238, 671.
- A13 Equations macroscopiques de la resonance quadrupolaire, F. Lurcat, 238, 1386.
- A14 Nouveaux effets en resonance quadrupolaire nucleaire, J. Duchesne and A. Monfils, 238, 1810.
- A15 L'elargissement quadrupolaire des raies de resonance magnetique nucleaire dans les liquides, Y. Ayant, 238, 1876.
- A16 Resonance quadrupolaire de Cl^{35} dans p-dichlorobenzene a basse temperature, M. Soutif, B. Dreyfus, and D. Dautreppe, 238, 2309.
- A17 Resonance quadrupolaire de Br^{79} et Br^{81} dans le para-dibromobenzene, D. Dautreppe and A. Blaise, 239, 493.
- A18 Variation des frequences Raman avec la temperature et resonance quadrupolaire, B. Dreyfus and D. Dautreppe, 239, 1618.

Academie des Sciences, Comptes Rendus (continued)1955

- A19 La resonance quadrupolaire dans les liquides, J. Seiden, 240, 1419.
- A20 Sur la relation entre les temps de relaxation et les probabilites de transition en resonance nucleaire (magnetique et quadrupolaire), F. Lurcat, 240, 2517.
- A21 Le spectre nucleaire quadrupolaire du 1, 2, 4, 5 - tetrachloro-benzene, A. Monfils, 241, 561.
- A22 Effet de la pression sur la resonance quadrupolaire nucleaire, D. Dautreppe and B. Dreyfus, 241, 795.
- A23 Sur l'elargissement du aux impuretes en resonance quadrupolaire, D. Dautreppe and B. Dreyfus, 241, 1751.

1956

- A24 Theorie de la relaxation par semi-rotations en resonance quadrupolaire, J. Seiden, 242, 763.
- A25 Effet de la pression sur la resonance quadrupolaire nucleaire de Cl^{35} dans HgCl_2 , D. Dautreppe and B. Dreyfus, 242, 766.
- A26 Spectres nucleaires quadrupolaires des α, β , et γ -hexachlorocyclohexanes, J. Duchesne, A. Monfils, and J. Depireux, 243, 144.
- A27 Effet d'impurete en resonance quadrupolaire, D. Dautreppe and B. Dreyfus, 243, 1517.

Academie des Sciences, Comptes Rendus (continued)

A28 Effet des fluctuations de pente sur la sensibilite des
autooscillateures, M. Buyle-Bodin, 243, 1618.

Acta Metallurgica

1953

B1 On the nuclear magnetic resonance in metals and alloys,
N. Bloembergen and T. J. Rowland, 1, 731.

1955

B2 Nuclear electric quadrupole interactions in aluminum,
T. J. Rowland, 3, 74.

American Chemical Society, Journal

1952

C1 The pure quadrupole spectra of solid chloroacetic acid and
substituted chloroacetic acids, H. C. Allen, Jr., 74, 6074.

C2 Correlation of Cl^{35} nuclear quadrupole coupling frequencies
with Hammett's Sigma, H. C. Meal, 74, 6121.

American Journal of Physics

1954

D1 Nuclear quadrupole resonance, H. C. Dehmelt, 22, 110; 22, 317.

Archives des Sciences

1956

F1 Effet de la pression sur la resonance quadrupolaire nucleaire,
D. Dautreppe and B. Dreyfus, 9, 156.

Archives des Sciences (continued)

- F2 Les impuretes en resonance quadrupolaire et la dynamique des reseaux cristallins, D. Dautreppe and B. Dreyfus, 9, 160.
- F3 Relaxations par semi-rotations en resonance quadrupolaire, J. Seiden, 9, 165.

1957

- F4 Equations macroscopiques de la resonance quadrupolaire et applications, F. Lurcat, 10, 267.
- F5 Resonance quadrupolaire nucleaire. Etude des solutions solides et influence des actions mecaniques, B. Dreyfus and D. Dautreppe, 10, 285.

Cahiers de Physique1955

- H1 Contribution a l'etude de la structure du p-dichlorobenzene par la resonance quadrupolaire, D. Dautreppe, 60, 16.
- H2 Variation de la frequence de resonance quadrupolaire dans les solides, B. Dreyfus and D. Dautreppe, 60, 18.

1957

- H3 Aspects theoriques de la resonance quadrupolaire, F. Lurcat, 80, 171.

Canadian Journal of Physics1952

- I1 Nuclear electric quadrupole interaction in single crystals, G. M. Volkoff, H. E. Petch, and D. W. L. Smellie, 30, 270.

Canadian Journal of Physics (continued)1953

- I2 Second order nuclear quadrupole effects in single crystals.
I. Theoretical, G. M. Volkoff, 31, 820.
- I3 Second order nuclear quadrupole effects in single crystals.
II. Experimental results for spodumene, H. E. Petch,
N. G. Cranna, and G. M. Volkoff, 31, 837.
- I4 A theoretical investigation of the nuclear resonance absorption
spectrum of Al^{27} in spodumene, G. Lamarche and G. M. Volkoff,
31, 1010.
- I5 A note on the ratio of the quadrupole moments of Li^6 and Li^7 ,
N. G. Cranna, 31, 1185.

1954

- I6 Further calculations on the nuclear resonance spectrum of Al^{27}
in spodumene, G. M. Volkoff and G. Lamarche, 32, 493.

1955

- I7 Nuclear magnetic resonance spectrum of B^{11} in kernite,
H. H. Waterman and G. M. Volkoff, 33, 156.
- I8 An investigation of the nuclear resonance absorption spectrum
of Al^{27} in a single crystal of euclase, R. G. Eades, 33, 286.

1956

- I9 Nuclear quadrupole resonance spectrum of B^{11} in kernite,
R. R. Haering and G. M. Volkoff, 34, 577.

Canadian Journal of Physics (continued)

- I10 The nuclear magnetic resonance spectrum of Na^{23} in $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$, F. Holuj and H. E. Petch, 34, 1169.
- I11 Nuclear magnetic resonance and electronic structure of conductors, N. Bloembergen, 34, 1299.

1957

- I12 Nuclear quadrupole resonance at low frequencies, L. B. Robinson, 35, 1344.

Faraday Society, Discussions1955

- J1 I. Microwave spectroscopy. Introductory paper: quadrupole couplings, dipole moments and the chemical bond, W. Gordy, 19, 14.
- J2 IV. Quadrupole spectroscopy. The interpretation of quadrupole spectra, B. P. Dailey, 19, 255.
- J3 IV. Quadrupole spectroscopy. An analysis of the gradient of the electric field in HCN, A. Bassompierre, 19, 260.
- J4 IV. Quadrupole spectroscopy. Nuclear quadrupole resonance in solids, H. G. Dehmelt, 19, 263.

Faraday Society, Transactions1954

- K1 Nuclear quadrupole interaction in bromine and iodine compounds, J. Hatton and B. V. Rollin, 50, 358.

Helvetica Physica Acta1956

- L1 Quadrupolverbreiterung der Kerninduktionslinie von Cl^{35} in flüssigen Verbindungen, P. Diehl, 29, 219.

Journal de Physique et le Radium1956

- M1 La theorie des temps de relaxation en resonance quadrupolaire, Y. Ayant, 17, 338.
- M2 La resonance quadrupolaire nucleaire, H. Kopfermann, 17, 366.

1957

- M3 Sur une cause possible d'elargissement du aux impuretes en resonance quadrupolaire nucleaire, B. Dreyfus and D. Dautreppe, 18, 31s.

Journal of Chemical Physics1949

- N1 Determination of electronic structure of molecules from nuclear quadrupole effects, C. H. Townes and B. P. Dailey, 17, 782.

1951

- N2 Interpretation of nuclear quadrupole coupling in molecules, W. Gordy, 19, 792.
- N3 The pure quadrupole spectrum of solid chlorine, R. Livingston, 19, 803.
- N4 Pure quadrupole spectra: the substituted methanes, R. Livingston, 19, 1434.

Journal of Chemical Physics (continued)

- N5 Pure quadrupole spectrum of solid vinyl chloride, J. H. Goldstein and R. Livingston, 19, 1613.

1952

- N6 Nuclear quadrupole effects and electronic structure of molecules in the solid state, C. H. Townes and B. P. Dailey, 20, 35.
- N7 The temperature dependence of the chlorine quadrupole coupling in solid benzene compounds, C. Dean and R. V. Pound, 20, 195.
- N8 Pure quadrupole spectra: aliphatic chlorine compounds, R. Livingston, 20, 1170.
- N9 Nuclear quadrupole spectra in solids, R. Bersohn, 20, 1505.
- N10 Nuclear quadrupole coupling constants and molecular vibrations, J. Duchesne, 20, 1804.

1953

- N11 Nuclear quadrupole resonance in some metal chlorides and oxychlorides, H. G. Dehmelt, 21, 380.
- N12 The pure quadrupole spectrum of hexachlorobenzene, T. L. Weatherly, E. H. Davidson, and Q. Williams, 21, 761.
- N13 Chlorine pure quadrupole resonances, D. W. McCall and H. S. Gutowsky, 21, 1300.
- N14 Nuclear quadrupole resonance of bromine in molecular solids, S. Kojima, K. Tsukada, S. Ogawa, and A. Shimauchi, 21, 1415.

Journal of Chemical Physics (continued)

- N15 Pure quadrupole spectra: alkyl bromides and iodides, H. Zeldes and R. Livingston, 21, 1418.
- N16 Chlorine quadrupole resonances in solids, P. J. Bray and P. J. Ring, 21, 2226.
- N17 Nuclear quadrupole resonance of iodine in molecular solids, S. Kojima, K. Tsukada, S. Ogawa, and A. Shimauchi, 21, 2237.

1954

- N18 Dipole moments, nuclear quadrupole coupling, and the bonding orbitals in group V - trihalides, P. Kisliuk, 22, 86.
- N19 Pure quadrupole spectra of solid bromine and iodine compounds, K. Shimomura, T. Kushida, N. Inoue, and Y. Imaeda, 22, 350.
- N20 Nuclear quadrupole couplings in solid bromides and iodides, H. Robinson, H. G. Dehmelt, and W. Gordy, 22, 511.
- N21 The pure quadrupole spectrum of solid hexachlorobenzene and its interpretation, J. Duchesne and A. Monfils, 22, 562.
- N22 Cl in SO₂Cl pure quadrupole spectra, P. J. Bray and D. Esteva, 22, 570.
- N23 Nuclear quadrupole resonances in some chlorine compounds, Q. Williams and T. L. Weatherly, 22, 572.
- N24 Deductions about hybridization from nuclear quadrupole coupling constants, P. N. Schatz, 22, 755.

Journal of Chemical Physics (continued)

- N25 Nuclear quadrupole resonances in solid aryl bromides and iodides, R. G. Barnes, O. B. Miller, F. O. Wooten, 22, 946.
- N26 Bromine nuclear quadrupole resonances, P. J. Bray, 22, 950.
- N27 Nuclear quadrupole resonance in ethyl chloroformate and ethyl trichloroacetate, T. L. Weatherly and Q. Williams, 22, 958.
- N28 Nuclear quadrupole resonances in solid bromine and iodine compounds, A. L. Schawlow, 22, 1211.
- N29 The pure quadrupole spectrum of 1, 2, 4-trichlorobenzene, A. Monfils and J. Duchesne, 22, 1275.
- N30 The crystal structure of para-dichlorobenzene, B. C. Lutz, 22, 1618.
- N31 Bromine quadrupole spectra and Hammett's sigma values, P. J. Bray, 22, 1787.
- N32 Pure quadrupole spectra of metal bromates, K. Shimomura, T. Kushida, N. Inoue, and Y. Imaeda, 22, 1944.
- N33 Hybridization and ionic character in CH_3Cl , P. N. Schatz, 22, 1974.
- N34 Nuclear quadrupole resonances in bromobenzene derivatives, P. J. Bray and R. G. Barnes, 22, 2023.
- N35 Double-bond character of conjugated carbon-chlorine bonds, R. Bersohn, 22, 2078.

Journal of Chemical Physics (continued)1955

- N36 Ionic character of diatomic molecules, B. P. Dailey and C. H. Townes, 23, 118.
- N37 Evidence for the interconversion of monochloroacetic acid by its pure quadrupole spectrum, H. Negita, 23, 214.
- N38 Cl^{35} pure quadrupole resonances in substituted chlorobenzene, P. J. Bray, 23, 220.
- N39 Nuclear quadrupole resonances of As^{75} , R. G. Barnes and P. J. Bray, 23, 407; 23, 1177.
- N40 Cl^{35} pure quadrupole resonances in acid chlorides and chlorates, P. J. Bray, 23, 703.
- N41 Nuclear quadrupole resonances of Sb^{121} and Sb^{123} , R. G. Barnes and P. J. Bray, 23, 1177.
- N42 Origin of the line width of pure quadrupole resonance, Y. Koi, A. Tsujimura, and T. Fuke, 23, 1346.
- N43 Chlorine nuclear quadrupole resonances in solid solutions, C. Dean, 23, 1734.
- N44 Nuclear quadrupole resonances in solid iodine compounds, S. Kojima, K. Tsukada, S. Ogawa, and A. Shimauchi, 23, 1963.
- N45 Nuclear quadrupole resonance of γ -irradiated para-dichlorobenzene, J. Duchesne, A. Monfils, and J. Garsou, 23, 1969.

Journal of Chemical Physics (continued)1956

- N46 Quadrupole coupling and bond character in the vinyl halides, J. H. Goldstein, 24, 106.
- N47 Nuclear magnetic resonance studies of bromine nuclei in ammonium bromide, J. Itoh and Y. Yamagata, 24, 621.
- N48 Pure quadrupole spectra of phosphonitrile chlorides, H. Negita and S. Satou, 24, 621.
- N49 Quadrupolar splitting of the Al^{27} and Be^9 magnetic resonances in beryl crystals, L. C. Brown and D. Williams, 24, 751.
- N50 Zeeman quadrupole spectra of p-chloroaniline and p-chlorobenzylchloride, H. C. Meal, 24, 1011.
- N51 Nuclear quadrupole levels in single crystals, P. M. Parker, 24, 1096.
- N52 Polymorphism of p-dichlorobenzene, C. Dean and E. Lindstrand, 24, 1114.
- N53 Some bromine, iodine, and indium nuclear quadrupole interaction frequencies, G. W. Ludwig, 25, 159.
- N54 Dimerization of solid group IIIIB trihalides. I. Bromine nuclear quadrupole resonance spectrum of AlBr_3 , R. G. Barnes and S. L. Segel, 25, 180.
- N55 Pure quadrupole spectra of the isomers of benzene hexachloride, Y. Morino, I. Miyagawa, T. Chiba, and T. Shimozawa, 25, 185.

Journal of Chemical Physics (continued)

- N56 Cl^{35} nuclear quadrupole resonances in TlCl_4 and WCl_6 ,
R. P. Hamlen and W. S. Koski, 25, 360.
- N57 Nuclear quadrupole coupling constants and vibrational states,
J. Duchesne, 25, 368.
- N58 Observation of hindered rotation in solid 1,2-dichloroethane
by nuclear quadrupole resonance, H. W. Dodgen and J. L. Ragle,
25, 376; 25, 1088.
- N59 Dimerization of solid group IIIB trihalides. II. Iodine
nuclear quadrupole resonance spectra of AlI_3 , GaI_3 , and InI_3 ,
S. L. Segel and R. G. Barnes, 25, 578.
- N60 As^{75} pure quadrupole resonance in synthetic claudetite,
P. J. Bray, G. O'Keefe, and R. G. Barnes, 25, 792.
- N61 Pure quadrupole resonances in multichlorobenzenes, P. J. Bray,
R. G. Barnes, and R. Bersohn, 25, 813.
- N62 Pure quadrupole resonances in multibromobenzenes, P. A. Cassabella,
P. J. Bray, S. L. Segel, and R. G. Barnes, 25, 1280.
- N63 Nuclear quadrupole resonances of Cl^{35} and Br^{79} in some
heterocyclic compounds, S. L. Segel, R. G. Barnes, and
P. J. Bray, 25, 1286.
- N64 Structural investigation of SnBr_4 by means of nuclear
quadrupole resonance, K. Shimomura, 25, 1298; 27, 599.

1957

- N65 Zeeman effect on the quadrupole spectrum of iodic acid,
R. Livingston and H. Zeldes, 26, 351.

Journal of Chemical Physics (continued)

- N66 Electric quadrupole interactions of deuterons and molecular motion in $\text{Li}_2\text{SO}_4 \cdot \text{D}_2\text{O}$, S. Ketudat and R. V. Pound, 26, 708.
- N67 Effect of impurities on the Cl^{35} quadrupole resonance in $\text{C}_6\text{H}_5\text{Cl}$, R. E. Michel and R. D. Spence, 26, 954.
- N68 Zeeman effect on the quadrupole spectra of sodium, potassium, and barium chlorates, H. Zeldes and R. Livingston, 26, 1102.
- N69 Dimerization of solid group IIIB trihalides. III. Bromine, gallium, and indium quadrupole resonances in GaBr_3 , GaI_3 , InBr_3 , and InI_3 , R. G. Barnes, S. L. Segel, P. J. Bray, and P. A. Cassabella, 26, 1345.
- N70 Quadrupole interaction of nuclei with conduction electrons, A. H. Mitchell, 26, 1714.
- N71 Nuclear quadrupole interaction in boron compounds, T. P. Das, 27, 1.
- N72 Estimates of Hammett's sigma values from quadrupole resonance studies, P. J. Bray and R. G. Barnes, 27, 551.
- N73 Pure quadrupole spectrum of cyanuric chloride, H. Negita and S. Satou, 27, 602.
- N74 Line width of the pure quadrupole resonance of bromine in KBrO_3 , Y. Koi, A. Tsujimura, and Y. Imaeda, 27, 603.
- N75 Nuclear quadrupole resonances in nitrogen compounds. I. Ammonia, deuterioammonia, and trimethylamine, C. T. O'Konski and T. J. Flautt, 27, 815.

Journal of Chemical Physics (continued)

- N76 Nuclear quadrupole coupling in the alkali chloriodides. I. Chlorine resonances, C. D. Cornwell and R. S. Yamasaki, 27, 1060.
- N77 Cl^{35} pure quadrupole resonance studies of relaxation times in solid solutions of p-dichlorobenzene, D. E. Woessner and H. S. Gutowsky, 27, 1072.

Journal of Physical Chemistry1953

- Q1 The chemical significance of quadrupole spectra, B. P. Dailey, 57, 490.
- Q2 Pure quadrupole spectra of solid chlorine compounds, R. Livingston, 57, 496.
- Q3 Evidences of crystalline imperfections in nuclear magnetism, R. V. Pound, 57, 743.

New York Academy of Sciences, Annals1952

- S1 Detection and measurement of direct nuclear quadrupole transitions, R. Livingston, 55, 743.

Onde Electrique1955

- T1 Spectrograph hertzian pour l'etude de la resonance quadrupolaire nucleaire, M. Buyle-Bodin, 35, 485.
- T2 Resonance quadrupolaire a basse temperature, D. Dautreppe, 35, 487.

22

Physica

1951

U1 Quadrupole frequencies in crystals, J. Kopfermann, 17, 386.

1954

U2 Theory of quadrupolar nuclear spin-lattice relaxation, I.
Van Kranendonk, 20, 781.

1956

U3 Intensite des spectres nucleaires quadrupolaires des solutions
solides, A. Monfils and D. Grosjian, 22, 541.

U4 Effet isotope en spectroscopie nucleaire quadrupolaire,
J. Duchesne, A. Monfils, and J. Garsou, 22, 816.

U5 Type d'action du rayonnement γ du Co^{60} sur le p-dichlorobenzene,
A. Monfils and J. Duchesne, 22, 818.

Physical Review

1948

V1 Effect of large quadrupole interactions on nuclear radio-
frequency spectra at twice Larmor frequency, N. F. Ramsey,
74, 286.

1949

V2 Determination of nuclear gyromagnetic ratios. I.
J. R. Zimmerman and D. Williams, 76, 350; 76, 1264.

V3 On the spatial alignment of nuclei, R. V. Pound, 76, 1410.

1950

V4 Angular dependence of crystalline nuclear resonance absorption,
E. F. Carr and C. Kikuchi, 78, 470.

Physical Review (continued)

V5 Nuclear electric quadrupole interactions in crystals,
R. V. Pound, 79, 685.

V6 On nuclear quadrupole moments, R. Sternheimer, 80, 102.

1951

V7 The electric quadrupole moment of Li^6 , N. A. Schuster and
G. E. Pake, 81, 157.

V8 Ratio of the quadrupole moments of Cl^{35} and Cl^{37} , S. Geschwind,
R. Gunther-Mohr, and C. H. Townes, 81, 288.

V9 Polarization of the nucleus by electric fields, G. R. Gunther-
Mohr, S. Geschwind, and C. H. Townes, 81, 289.

V10 The quadrupole moment ratio of Cl^{35} and Cl^{37} from pure
quadrupole spectra, R. Livingston, 82, 289.

V11 Nuclear electric quadrupole splitting in crystalline I_2 ,
R. V. Pound, 82, 343A.

V12 On nuclear quadrupole moments, R. Sternheimer, 84, 244.

V13 Nuclear electric quadrupole interaction in crystals with
non-axially symmetric fields, H. E. Petch, B. W. Smellie,
and G. M. Volkoff, 84, 602.

1952

V14 The pure nuclear electric quadrupole resonance of N^{14} in
three molecular solids, G. D. Watkins and R. V. Pound, 85,
1062.

Physical Review (continued)

- V15 The effects of configuration interaction on the atomic hyperfine structure of gallium, G. F. Koster, 86, 148.
- V16 The Zeeman effect of the chlorine nuclear quadrupole rf resonance, C. Dean, 86, 607.
- V17 Quadrupole coupling ratio of the chlorine isotopes, T. C. Wang, C. H. Townes, A. L. Schawlow, and A. N. Holden, 86, 809.
- V18 Second-order effects in nuclear electric quadrupole interaction of Al^{27} in spodumene, H. E. Petch, G. M. Volkoff, and N. G. Cranna, 88, 1201.

1953

- V19 Pure nuclear quadrupole spectrum of Bi^{209} in bismuth-triphenyl, H. G. Robinson, H. G. Dehmelt, and W. Gordy, 89, 1305.
- V20 Pure quadrupole spectra of HCl and DCl, H. C. Meal and H. C. Allen, Jr., 90, 348.
- V21 The quadrupole moment ratio of I^{129} and I^{127} from pure quadrupole spectra, R. Livingston and H. Zeldes, 90, 609.
- V22 Nuclear quadrupole resonance in rhombic sulfur and quadrupole moments of S^{33} and S^{35} , H. G. Dehmelt, 91, 313.
- V23 Nuclear magnetic resonance in solid hydrogen, F. Reif and E. M. Purcell, 91, 631.
- V24 Dipolar broadening of the quadrupole resonance line width in zero applied field, A. Abragam and K. Kambe, 91, 894.

Physical Review (continued)

- V25 Nuclear quadrupole resonances of stable gallium isotopes,
H. G. Dehmelt, 92, 1240.
- V26 Zeeman splitting of nuclear quadrupole resonance lines,
Y. Ting, E. Manring, and D. Williams, 92, 1581.

1954

- V27 Electric field gradients of atomic p electrons, R. G. Barnes
and W. V. Smith, 93, 95.
- V28 Transient nuclear induction signals associated with pure
quadrupole interactions, M. Bloom and R. E. Norberg, 93, 638.
- V29 Anisotropic relaxation of quadrupole spin echoes, E. L. Hahn
and B. Herzog, 93, 639.
- V30 Nuclear quadrupole coupling in polar molecules, H. M. Foley,
R. M. Sternheimer, and D. Tycko, 93, 734.
- V31 "Slow beats" in nuclear quadrupole induction, M. Bloom, 94,
1396.
- V32 Effect of atomic core on nuclear quadrupole coupling,
R. M. Sternheimer, 95, 736.
- V33 Magnetic resonance spectra of beryl crystals, L. C. Brown
and D. Williams, 95, 1110.
- V34 Zeeman effects in the chlorine nuclear quadrupole resonance
in sodium chlorate, Y. Ting, E. R. Manring, and D. Williams,
96, 408.

Physical Review (continued)

- V35 Nuclear electric quadrupole interactions of B^{11} in kernite, H. L. Blood and W. G. Proctor, 96, 861.
- V36 Zeeman splitting of nuclear quadrupole resonances, C. Dean, 96, 1053.
- V37 Nuclear quadrupole spectra in solids, M. H. Cohen, 96, 1278.
- V38 Nuclear resonance of Nb^{93} in $KNbO_3$, R. M. Cotts and W. D. Knight, 96, 1285.

1955

- V39 Free magnetic induction in nuclear quadrupole resonance, M. Bloom, E. L. Hahn, and B. Herzog, 97, 1699.
- V40 Electric quadrupole interaction and spin echoes in crystals, T. P. Das and A. K. Saha, 98, 516.
- V41 Saturation of nuclear electric quadrupole energy levels by ultrasonic excitation, W. G. Proctor and W. H. Tantttila, 98, 1854.
- V42 Pure nuclear quadrupole spectra of chlorine and antimony isotopes in solids, T. C. Wang, 99, 566.
- V43 Pure quadrupole spectra of CH_3I and CF_3I vapors, F. Sterzer and Y. Beers, 100, 1174.
- V44 Nuclear magnetic resonance studies of imperfect ionic crystals, F. Reif, 100, 1597.
- V45 Quadrupole spectrum of $BiCl_3$, H. G. Robinson, 100, 1731.
- V46 Nuclear magnetic dipole and electric quadrupole energy relations, L. C. Brown and P. M. Parker, 100, 1764.

Physical Review (continued)1956

- V47 Influence of ultrasonic energy on relaxation of Cl nuclei in NaClO_3 , W. G. Proctor and W. H. Tanttilla, 101, 1757.
- V48 Nuclear quadrupole coupling in polar molecules, R. M. Sternheimer and H. M. Foley, 102, 731.
- V49 Variational approach to quadrupole polarizability of ions, T. P. Das and R. Bersohn, 102, 733.
- V50 Ultrasonic saturation of nuclear magnetic energy levels, W. G. Proctor and W. A. Robinson, 102, 1183.
- V51 Transient nuclear induction and double nuclear resonance in solids, B. Herzog and E. L. Hahn, 103, 148.
- V52 Nuclear quadrupole resonance in metals, W. D. Knight, R. R. Hewitt, and M. Pomerantz, 104, 271.
- V53 Nuclear quadrupole interactions in two Tutton's salts, R. F. Kiddle and W. G. Proctor, 104, 932.
- V54 Ultrasonic excitation of the nuclear magnetic energy levels of Na^{23} in NaCl , W. G. Proctor and W. A. Robinson, 104, 1344.
- V55 Dependence of the pure quadrupole resonance frequency on pressure and temperature, T. Kushida, G. B. Benedek, and N. Bloembergen, 104, 1364.
- V56 Quadrupolar nuclear spin-lattice relaxation in crystals with body-centered cubic lattice structure, T. P. Das, D. K. Roy, and S. K. Ghosh Roy, 104, 1568.

Physical Review (continued)1957

- V57 Effect of the atomic core on the nuclear quadrupole coupling, R. N. Sternheimer, 105, 158.
- V58 Sodium nuclear quadrupole interactions in NaClO_3 and NaBrO_3 , H. S. Gutowsky and G. A. Williams, 105, 464.
- V59 Nuclear quadrupole moment ratio of Re^{185} and Re^{187} , S. L. Segel and R. G. Barnes, 107, 638.
- V60 Nuclear magnetic resonance in semiconductors. II. Quadrupole broadening of nuclear magnetic resonance lines by elastic axial deformation, R. G. Shulman, B. J. Wyluda, and P. W. Anderson, 107, 953.
- V61 Proposal for a nuclear quadrupole maser, R. Braunstein, 107, 1195.

Physical Society of Japan, Journal1952

- W1 Quadrupole resonance in solid iodine, T. Kamei, 7, 649.

1954

- W2 The electric quadrupole splitting of the nuclear magnetic resonance lines of sodium in a single crystal of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$, J. Itoh, R. Kusaka, and Y. Yamagata, 9, 209.
- W3 Nuclear quadrupole interaction in sodium chlorate and sodium bromate, J. Itoh and R. Kusaka, 9, 434.

Physical Society of Japan, Journal (continued)

- W4 Chlorine pure quadrupole spectra in some solid compounds,
K. Torizuka, 9, 645.
- W5 Zeeman splitting of nuclear quadrupole resonance line of
bromine, S. Kojima, K. Tsukada, A. Shimauchi, and Y. Hinaga,
9, 795.
- W6 Nuclear quadrupole resonances in arsenic tribromide and arsenic
triiodide, S. Kojima, K. Tsukada, S. Ogawa, A. Shimauchi, and
Y. Abe, 9, 805.
- W7 Zeeman splitting of nuclear quadrupole spectrum of NaBrO_3 ,
T. Kushida, Y. Koi, and Y. Imaeda, 9, 809.
- W8 Contributions of overlap integral to nuclear quadrupole
coupling, K. Tsukada, 9, 872.
- W9 A general theory of magnetic resonance absorption, R. Kubo
and K. Tomita, 9, 888.

1955

- W10 On the halogen magnetic resonance of some metal halides. I.
T. Kanda, 10, 85.
- W11 On the piezoelectric lines at sub-microwave frequencies,
S. Kojima, K. Tsukada, S. Ogawa, A. Shimauchi, and
N. Matsumiya, 10, 265.
- W12 Zeeman splitting of nuclear quadrupole resonance in
p-dibromobenzene, S. Kojima, K. Tsukada, and Y. Hinaga, 10,
498; 10, 828.

Physical Society of Japan, Journal (continued)

- W13 Fine structure of pure quadrupole spectrum in iodine crystal, S. Kojima and K. Tsukada, 10, 591
- W14 Observation of nuclear quadrupole resonances with a coaxial-cavity spectrometer, S. Kojima, A. Shimauchi, S. Hagiwara, and Y. Abe, 10, 930.

1956

- W15 The effects of covalency on the nuclear resonance in ionic crystals, K. Yoshida and T. Moriya, 11, 33.
- W16 Dipolar broadening of the central line of a magnetic resonance for half-integral spin, K. Kambe and J. F. Ollom, 11, 50.
- W17 Pure quadrupole spectra of phosphonitrile chloride polymers, K. Torizuka, 11, 84.
- W18 On the lithium resonance in lithium sulfate monohydrate $\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$, A. M. Murakami and E. Hirahara, 11, 607.
- W19 Nuclear magnetic resonance in molecular chlorine compounds, Y. Masuda, 11, 670.
- W20 Zeeman splitting of nuclear quadrupole resonance line of iodine, K. Tsukada, 11, 956.
- W21 Structure of nuclear quadrupole resonance line. I. Solid iodine, S. Kojima, S. Ogawa, S. Hagiwara, Y. Abe, and M. Minematsu, 11, 964.
- W22 The quadrupolar effect in alkali halide mixed crystals, H. Kawamura, E. Otsuka, and K. Ishiwatari, 11, 1064.

Physical Society of Japan, Journal (continued)1957

- W23 Line width of the pure quadrupole resonance of bromine in NaBrO_3 , Y. Koi, 12, 49.
- W24 Structural investigation by means of nuclear quadrupole resonance. I. Determination of crystal symmetry, K. Shimomura, 12, 652.
- W25 Structural investigation by means of nuclear quadrupole resonance. II. Tin tetrabromide, K. Shimomura, 12, 657.
- W26 Electron coupled interaction in solid iodine, T. Itoh and K. Kambe, 12, 763.
- W27 Influence of temperature on the pure nuclear quadrupole resonance in hexachloroethane, I. Tatsuzaki and Y. Yokozawa, 12, 802.
- W28 Proposal for a solid-state radiofrequency maser, J. Itoh, 12, 1053.
- W29 Nuclear quadrupole resonance of antimony isotopes in solids, S. Ogawa, 12, 1105.
- W30 Iodine quadrupole resonance in ICl_3 and AlI_3 , S. Hagiwara, K. Kato, Y. Abe, and M. Minematsu, 12, 1166.
- W31 Structure of nuclear quadrupole resonance line. II. Solid bromine, S. Kojima, Y. Abe, M. Minematsu, K. Tsukada, and A. Shimauchi, 12, 1225.

Physical Society of Japan, Journal (continued)

- W32 Structural investigation by means of nuclear quadrupole resonance. III. Arsenic tribromide, K. Shimomura, 12, 1386.

Review of Scientific Instruments1947

- X1 Two new methods for detecting nuclear radiofrequency resonance absorption, A. Roberts, 18, 845.

1949

- X2 Amplitude bridge for detection of nuclear resonance, H. A. Thomas and R. D. Huntoon, 20, 516.

1950

- X3 A radiofrequency spectrograph and simple magnetic-field meter, R. V. Pound and W. D. Knight, 21, 219.

1951

- X4 Phase sensitive detector circuit having high balance stability, N. A. Schuster, 22, 254.
- X5 A transition nuclear magnetic resonance detector, H. W. Knoebel and E. L. Hahn, 22, 904.

1952

- X6 A bridged tee detector for nuclear magnetic resonance, C. E. Waring, R. H. Spencer, and R. L. Custer, 23, 497.

1953

- X7 Circuit for a radio-frequency spectrometer, J. Gindsberg and Y. Beers, 24, 632.

Review of Scientific Instruments (continued)

X8 Apparatus for nuclear magnetic resonance, H. S. Gutowsky,
L. H. Meyer, and R. E. McClure, 24, 644.

1954

X9 Rf phase-sensitive detector for nuclear magnetic resonance
signals, E. B. Baker, 25, 390.

1956

X10 Bolometer detection of nuclear quadrupole resonance,
H. G. Robinson, 27, 163.

X11 Nuclear induction spectrometer for use at high rf intensities
and low temperatures, A. G. Redfield, 27, 230.

1957

X12 Precise nuclear resonance thermometer, G. B. Benedek and
T. Kushida, 28, 92.

1958

X13 Nuclear resonance pulse apparatus, J. C. Buchta, H. S. Gutowsky,
D. E. Woessner, 29, 55.

Science1953

Y1 Pure quadrupole spectra in solids, R. Livingston, 118, 61.

Zeitschrift für Physik1951

Z1 Quadrupol-Resonanzfrequenzen von Cl- und Br-Kernen in
krystallinem Dichloräthylen und Methylbromid, H. G. Dehmelt
and H. Krüger, 129, 401.

Zeitschrift für Physik (continued)

- Z2 Zur Theorie der Spin-Gitterrelaxation in Molekülkristallen,
H. Bayer, 130, 227.
- Z3 Quadrupol-Resonanzfrequenze von I^{127} -Kernen in kristallinen
kovalenten Jodverbindungen, H. G. Dehmelt, 130, 356.
- Z4 Zum Verhältnis der Kernquadrupolmomente der Kupferisotope,
G. Becker, 130, 415.
- Z5 Beiträge zur Untersuchung der reinen Kernquadrupolspektren
in Kristallen, H. Krüger, 130, 371; 130, 656.
- Z6 "Über das Quadrupolresonanzspektrum in kristallinem
Antimontrichlorid und das Verhältnis der Antimonkern-
quadrupolmomente, H. G. Dehmelt and H. Krüger, 130, 385.
- Z7 Quadrupolresonanzfrequenzen des kristallinen Broms,
H. G. Dehmelt, 130, 480.

1952

- Z8 Kernquadrupol-Resonanzfrequenzen von Cu-Kernen in
polykristallinen Kupferverbindungen, H. Krüger and U. Meyer-
Berkhout, 132, 171.
- Z9 Bestimmung des magnetischen Moments des As^{75} -Kerns aus dem
Zeeman-Effekt eines Kernquadrupol-Resonanzübergangs, H. Krüger
and U. Meyer-Berkhout, 132, 221.
- Z10 Kernquadrupolspektren in zwei Bortrialkylen, H. G. Dehmelt,
133, 528.

1953

- Z11 Nachtrag zu "Kernquadrupolspektren in zwei Bortrialkylen",
H. G. Dehmelt, 134, 642.

Project Reports

ZA1 Table of eigenvalues for pure quadrupole spectra, spin $5/2$,
R. Livingston and H. Zeldes, US: AEC Report ORNL-1913 Special,
July 13, 1955.

INDEX

- Crystal Structure: H1, N64, N65, W24, W25, W32.
- Descriptive Material: D1, J4, M2, Q1, Q3, S1, Y1.
- Hammett's Sigma Parameter: C2, N31, N34, N61, N62, N63, N72.
- Hindered Rotations: A24, F3, N58, N66.
- Impurities: A14, A23, A27, F2, M3, N67, V44.
- Line Widths: A2, A9, A10, A15, L1, N42, N74, V24, W16, W19, W23.
- Masers: V61, W28.
- Nuclear Alignment: V3.
- Nuclear Moments and Ratios: I5, V2, V6, V7, V8, V9, V10, V12, V17, V21, V22, V25, V59, Z4, Z6, Z9.
- Phase Transitions: A14, N37, N52, N58, N60.
- Piezoelectric Resonances: W11.
- Pressure Dependence of Quadrupole Couplings: A22, A25, F1, V55, V58, V60.
- Radiation Damage: N45, V5.
- Relaxation Times: A20, N70, N77, V2, V47, V56, W19.
- Resonances in Ferroelectrics: V38.
- Resonances in Inorganic Compounds: A5, A8, A12, I1, I3, I7, I8, I9, I10, I11, I12, N3, N11, N13, N14, N17, N18, N19, N20, N28, N32, N39, N40, N41, N42, N44, N47, N49, N53, N54, N56, N59, N60, N64, N65, N66, N69, N73, N76, Q2, V11, V14, V19, V20, V22, V23, V25, V38, V42, V45, V53, V58, V59, V60, W1, W3, W4, W5, W6, W10, W21, W22, W29, W30, Z3, Z6, Z7, Z8, Z9.

Resonances in Metals and Alloys: B1, B2, I11, N70, V52.

Resonances in Organic Compounds: A3, A6, A7, A16, A17, A21, A26, C2, C1, H1, K1, N4, N5, N7, N8, N12, N13, N14, N15, N16, N17, N19, N21, N22, N23, N25, N26, N27, N28, N29, N30, N31, N34, N37, N38, N40, N48, N53, N55, N61, N62, N63, N72, N73, N75, Q2, V14, V17, V42, V43, W4, W14, W17, Z1, Z3, Z10, Z11.

Solid Solutions: F5, N43, U3.

Spectrometers: A1, A4, A28, T1, V2, W14, X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12, X13.

Spin - Spin Interactions: A10, N65, W13, W26, W31.

Temperature Dependence of Quadrupole Couplings: A16, A18, H2, N7, T2, V55, W27, X12, Z2.

Theory of Quadrupole Coupling Constants: A11, A18, A19, J1, J2, J3, N1, N2, N6, N10, N18, N24, N33, N35, N36, N46, N57, N71, V15, V27, V30, V32, V48, V49, V57, W8, W15.

Theory of Quadrupole Resonance Spectra: A13, F4, H3, N9, N70, Q1, U1, V1, V5, V37, W9, ZA1, Z5.

Theory of Zeeman Effects: I2, I4, I6, N9, N51, V4, V5, V13, V16, V26, V34, V36, V37, V46, W24.

Transient Effects (Echos): V28, V29, V31, V39, V40, V51, X13.

Ultrasonic Effects on Spectra: V41, V47, V50, V54.

Zeeman Effect (Experimental): H1, I1, I3, I7, I8, I9, I10, N30, N49, N50, N52, N64, N65, N68, V11, V16, V18, V33, V34, V35, W2, W7, W12, W13, W18, W20, W32, Z9.