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ORGANOMETALLIC AND COORDINATION DERIVATIVES

OF MAIN GROUP ELEMENTS

Glen Berenger Deacon, Ph.D. (Adelaide)

Department of Chemistry, Monash University

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SUMMARY

This thesis presents a series of publications relating to the chemistry of organometallic and coordination derivatives of main group elements. Investigations have centred on organomercury compounds, coordination derivatives of zinc, cadmium, and mercury, organothallium compounds, and organophosphorus and organoarsenic compounds, together with less extensive studies of organoindium, organolead, and organobismuth compounds. Emphasis has been placed on the chemistry of organometallics with electronegative substituents in the organic groups, on elimination reactions in organometallic synthesis, on structures of sulphinate and carboxylate complexes, on organometallic coordination chemistry, and on the infrared spectra of organometallic compounds and main group element halide complexes.

This thesis contains no material which has been submitted for a degree in any University by the author or other persons, except where due reference is made in the text.

G. B. Deacon,
Department of Chemistry,
Monash University,
September 1, 1971.

ACKNOWLEDGEMENTS

I wish to thank all who have been connected with the work of this thesis, particularly Dr. J.H.S. Green and my many other collaborators, and my research students whose untiring efforts have been greatly appreciated. I owe a long standing debt to Mr. S. Eberhard and Professor B.O. West for awakening my interest in chemistry and chemical research, respectively. I am also grateful to the C.S.I.R.O., to Imperial Chemical Industries, and to the Australian Research Grants Committee for their support.

PREFACE

Table of Collaborators

Comments on Collaborative Studies

Collaborators and Research Students (in chronological order)

<u>Collaborators</u>	<u>Years</u>	<u>References</u>
Dr. B.O. West, Ph.D. Supervisor, University of Adelaide.	1958-1961	B1, 2, 3, 5. E1*
Dr. R.A. Jones, University of Adelaide	1961, 1962	D1*, 2, 3
Mr. P.E. Rogasch, Weapons Research Establishment, S.A.	1962	D2
Professor R.S. Nyholm, University College London	1963-1965	C1, 2, 3
Dr. J.H.S. Green, National Chemical Laboratory and National Physical Laboratory, Teddington	1963-1968	A1, 2, 11. B8, 9 C2, 5, 7, 8. D4, 5, 6, 7, 8, 9, 10, 11, 12
Professor W.R. Cullen, University of British Columbia	1963-1965	D5, 6
Dr. (now Professor) A.G. Davies, University College London	1964, 1965	A1, 2
Dr. J.E. Connett, National Chemical Laboratory,	1964, 1965	A1, 2, 3
Mr. W. Kynaston, National Chemical Laboratory,	1964, 1965	B8, C5
Mr. D.J. Harrison, National Chemical Laboratory,	1965	D11
Dr. J.A. Creighton, National Chemical Laboratory,	1965	D8
Dr. F.B. Taylor, University College London and Northern Polytechnic	1965-1969	A8, 15, 19 B7, 9

<u>Collaborators</u>	<u>Years</u>	<u>References</u>
Mr. (now Dr.) P.W. Felder, Monash University, B.Sc. (Hons.) student Ph.D. student	1966 1967-1969	A4,6. E2 [†] A9,12,16,18,21 [†] E3,5. F1,2 [†]
Mr. A.J. Canty, Monash University, B.Sc. (Hons.) student M.Sc./Ph.D. student [‡]	1967 1968-1970	A6,10,14 [†] A17,23 [†]
Mr. J.C. Parrott, Monash University, Ph.D. student	1968-1971	C9,11,12. E6,7 [†]
Professor B.O. West) Dr. K.S. Murray) Monash Mr. R.J. Cozens,) University B.Sc. (Hons.) student	1968	F1,2 [†]
Miss M.J. Osborne, Monash University, B.Sc. (Hons.) student	1968	A20 [†]
Dr. V.N. Garg, Monash University, Ph.D. student	1968-1971	C10,13,14 [†]
Mr. P.G. Cookson, Monash University, B.Sc. (Hons.) student Ph.D. student	1969 1970,1971	B10,11 [†] A24,25 [†]
Mr. H.B. Albrecht, Monash University, B.Sc. (Hons.) student	1969	A20 [†]
Mr. G.D. Fallon, Monash University, B.Sc. (Hons.) student	1970	E5 [†]

* These references and B4 contain results from my Ph.D. thesis.

† Results in these references are included, or will be included, in the theses or research reports for the degrees indicated.

‡ Work carried out while enrolled as an M.Sc. student; candidature subsequently transferred to Ph.D. with change of supervisor.

Comments on Collaborative Studies leading to Joint Publication

Several publications (see Table) are derived from my Ph.D. thesis, while a considerable number result from work of my research students. The collaboration with Dr. R.A. Jones arose from a combination of my interest in the spectra of Group V organometallics with Dr. Jones' spectroscopic experience. The assistance of Mr. P.E. Rogasch with instrumentation and spectroscopic measurements led to his inclusion on one of the papers. In the collaboration with Professor R.S. Nyholm, a programme of organothallium chemistry was initiated with a view to synthesizing compounds with thallium-thallium or thallium-other metal bonds. My initial contribution was to suggest the use of the pentafluorophenyl ligand as a means of increasing the Lewis acidity of thallium in its organometallic derivatives, and this led to a study of organothallium coordination chemistry rather than attempts to prepare thallium-metal bonds.

The following comments on the extensive collaboration with Dr. J.H.S. Green are supported by a signed statement from Dr. Green (p. 5). The studies originated from a combination of my chemical

and structural interests with the spectroscopic interests of Dr. Green, and were jointly initiated, directed, and carried out, and the resulting publications were prepared jointly. Where further experimental help was needed, suitable collaborators, generally from Dr. Green's colleagues, were introduced to the programme, and became co-authors of the resulting papers. In general, the individual contributions of Dr. Green and myself are indistinguishable in the publications, but the following individual features may be isolated :

- (a) Calculations of mercury-nitrogen stretching frequencies, p. 1185 of ref. A11 (J.H.S.G.).
- (b) Discussion of degeneracy-weighted zinc-halogen frequencies, p.p. 2075-2076 of ref. B9 (J.H.S.G.).
- (c) Normal coordinate calculations, p.p. 887-888 of ref. C7 (J.H.S.G.).
- (d) Normal coordinate calculations, p. 584 and Table 2 of ref. D8 (J.H.S.G.). (This specific contribution is acknowledged in the text of the paper.)
- (e) Discussion of reaction paths involving diphenylmercuriammonium compounds, p.p. 1185-1186 of ref. A11 (G.B.D.).
- (f) Relationship between spectra and structures of bis(pentafluorophenyl)thallium(III) compounds, pp. 1129, 1132, and 1133 of ref. C8 (G.B.D.).

Professor W.R. Cullen provided the compounds for two studies of the spectra of quaternary arsonium compounds by Dr. Green and myself, and hence is a co-author of the resulting papers. The collaboration with Dr. (now Professor) A.G. Davies arose from a joint interest in elimination reactions. Dr. Green joined the study because of associated spectroscopic problems and arranged for Dr. J.E. Connett to assist with the experimental programme. The collaboration with Dr. Connett was then extended to a further investigation. The joint studies with Dr. F.B. Taylor were initiated, directed, and written up by myself, and the experimental programme was carried out almost entirely by Dr. Taylor. A combination of my interests in sulphur dioxide insertion and sulphinate complexes, and those of Professor B.O. West and Dr. K.S. Murray in Schiff's base organometallics led to a recent collaboration.

INTRODUCTION

The publications presented in this thesis may conveniently be subdivided under the following headings :

- A. Organomercury Compounds
- B. Coordination Compounds of Zinc, Cadmium, and Mercury
- C. Organothallium Compounds
- D. Organophosphorus and Organoarsenic Compounds
- E. Derivatives of other Main Group Elements and General Main Group Element References
- F. Miscellaneous

The papers are arranged chronologically in each section.

Several themes link these sections, e.g. organometallic compounds with electronegative substituents in the organic groups (Sections A, C and E); elimination reactions in organometallic synthesis (Sections A and E); structures of sulphinate and carboxylate complexes (Sections A, B, C, E and F); coordination chemistry of organometallics (Sections A, C and E); infrared spectra of organometallic compounds (Sections A, C and D); anionic metal halide complexes (Sections B and C); and far infrared spectra of metal halide complexes (Sections B, C and D).

INDEX TO

PUBLICATIONS

SECTION A. Organomercury Compounds

1. Decarboxylation as a route to pentafluorophenylmercury Compounds, by J.E. Connett, A.G. Davies, G.B. Deacon and J.H.S. Green, *Chem. and Ind.*, 1965, 512.
Collaborators: Drs. J.E. Connett, A.G. Davies and J.H.S. Green.
2. Organomercury compounds. Part I. Mercury pentafluorobenzoates and their decarboxylation to pentafluorophenylmercury compounds, by J.E. Connett, A.G. Davies, G.B. Deacon and J.H.S. Green, *J. Chem. Soc.*, 1966 (C), 106.
Collaborators: Drs. J.E. Connett, A.G. Davies, and J.H.S. Green.
3. Organomercury compounds. Part II. Preparations of complexes of bisperfluoroalkylmercurials by decarboxylation reactions, by G.B. Deacon and J.E. Connett, *J. Chem. Soc.*, 1966 (C), 1058.
Collaborator: Dr. J.E. Connett.
4. Organomercury compounds. Part III. Acceptor properties of bispentachlorophenylmercury, by G.B. Deacon and P.W. Felder, *Aust. J. Chem.*, 1966, 19, 2381.
Research student: Mr. P.W. Felder, B.Sc. (Hons.) student.
5. Organomercury compounds. Part IV. Infrared spectra, structures, and thermal decomposition of mercuric Arylsulphinates, by G.B. Deacon, *Aust. J. Chem.*, 1967, 20, 1367.
6. Novel organomercury complexes, by A.J. Canty, G.B. Deacon and P.W. Felder, *Inorg. and Nucl. Chem. Letters*, 1967, 3, 263.
Research students: A.J. Canty and P.W. Felder, B.Sc. (Hons.) students.
7. Facile cleavage of pentafluorophenylmercury compounds, by G.B. Deacon, *J. Organomet. Chem.*, 1967, 9, P1.
8. The mercuration route to pentafluorophenylmercury compounds, by G.B. Deacon and F.B. Taylor, *Inorg. and Nucl. Chem. Letters*, 1967, 3, 369.
Collaborator: Dr. F.B. Taylor.

9. Organomercury compounds. Part V. Preparations of pentachlorophenylmercury compounds by decarboxylation reactions, by G.B. Deacon and P.W. Felder, *J. Chem. Soc.*, 1967(C), 2313. Research student: Mr. P.W. Felder, Ph.D. student.
10. The preparation of complexes of phenylmercuric chloride, by G.B. Deacon and A.J. Canty, *Inorg. and Nucl. Chem. Letter*, 1968, 4, 125. Research student: Mr. A.J. Canty, B.Sc. (Hons.) student.
11. Di(phenylmercuri)ammonium compounds, by G.B. Deacon and J.H.S. Green, *J. Chem. Soc.*, 1968(A), 1182. Collaborator: Dr. J.H.S. Green.
12. Linkage Isomerism in phenylmercuric benzenesulfinate, by G.B. Deacon and P.W. Felder, *J. Amer. Chem. Soc.*, 1968, 90, 493; Correction, 6895. Research student: Mr. P.W. Felder, Ph.D. student.
13. Organomercury compounds. Part VI. Disproportionation reactions of pentahalophenylmercuric halides with halide ions, by G.B. Deacon, *J. Organomet. Chem.*, 1968, 12, 389.
14. Organomercury compounds. Part VII. Complexes of arylmercuric halides with bidentate ligands, by A.J. Canty and G.B. Deacon, *Aust. J. Chem.*, 1968, 21, 1757. Research student: Mr. A.J. Canty, B.Sc. (Hons.) student.
15. Organomercury compounds. Part VIII. The preparation of pentafluorophenylmercury compounds by mercuration reactions, by G.B. Deacon and F.B. Taylor, *Aust. J. Chem.*, 1968, 21, 2675. Collaborator: Dr. F.B. Taylor.
16. The reversal of sulphur dioxide insertion into metal-carbon bonds, by G.B. Deacon and P.W. Felder, *Inorg. and Nuclear Chem. Letters*, 1968, 4, 645. Research student: Mr. P.W. Felder, Ph.D. student.
17. The preparation of adducts of diphenylmercury with bidentate ligands, by G.B. Deacon and A.J. Canty, *Inorg. and Nuclear Chem. Letters*, 1969, 5, 183. Research student: Mr. A.J. Canty, M.Sc./Ph.D. student.

18. Organomercury compounds. Part IX. Preparations, structures, and thermal decomposition of some arylmercuric arenesulphinates, by G.B. Deacon and P.W. Felder, *Aust.J.Chem.*, 1969, 22, 549.
Research student: Mr. P.W. Felder, Ph.D. student.
19. The mercuriation of pentachlorobenzene: A simple route to bispentachlorophenylmercury, by G.B. Deacon and F.B. Taylor, *Inorg. and Nuclear Chem. Letters*, 1969, 5, 477.
Collaborator: Dr. F.B. Taylor.
20. A simple new route to polyfluoroarylmercurials, by G.B. Deacon, H.B. Albrecht, and Margaret J. Osborne, *Inorg. Nuclear Chem. Letters*, 1969, 5, 985.
Research students: Mr. H.B. Albrecht and Miss M.J. Osborne, B.Sc. (Hons.) students.
21. Organomercury compounds. Part X. Reactions of diarylmercurials with arene-sulphinic and -sulphonic acids, by G.B. Deacon and P.W. Felder, *Aust.J.Chem.*, 1970, 23, 1275.
Research student: Mr. P.W. Felder, Ph.D. student.
22. Australian patent application no. 17702/70 (formerly no. 58503/69) "Fluorinated arylmercury compounds and preparations thereof", filed in the name of Monash University.
Inventors: G.B. Deacon, H.B. Albrecht [B.Sc. (Hons.) student], and M.J. Osborne [B.Sc. (Hons.) student].
23. Organomercury compounds. Part XI. Some coordination derivatives of bispentafluorophenylmercury, by A.J. Canty and G.B. Deacon, *Aust.J.Chem.*, 1971, 24, 489.
Research student: Mr. A.J. Canty, M.Sc./Ph.D. student.
24. The formation of mercury-carbon bonds by sulphur trioxide elimination, by P.G. Cookson and G.B. Deacon, *J. Organomet. Chem.*, 1971, 27, C9.
Research student: Mr. P.G. Cookson, Ph.D. student.
25. Organomercury compounds. Part XII. The synthesis of diarylmercurials and arylmercuric arenesulphinates by sulphur dioxide elimination reactions, by P.G. Cookson and G.B. Deacon, *Aust.J.Chem.*, 1971, 24, 1599.
Research student: Mr. P.G. Cookson, Ph.D. student.

SECTION B. Coordination Compounds of Zinc, Cadmium, and Mercury.

1. Iodomercurate complexes with group V quaternary iodides.
Part I. Aqueous decompositions and absorption spectra, by G.B. Deacon and B.O. West, *J. Chem. Soc.*, 1961, 3929.
Dr. B.O. West, Ph.D. Supervisor.
2. Iodomercurate complexes with group V quaternary iodides.
Part II. Reactions with triphenylphosphine, by G.B. Deacon and B.O. West, *J. Chem. Soc.*, 1961, 5127.
Dr. B.O. West, Ph.D. Supervisor.
3. The reactions of metal complexes with alkyl halides. Part I. Reactions of halo(triphenylphosphine)mercury(II) and quaternary halomercurate(II) complexes, by G.B. Deacon and B.O. West, *J. Inorg. Nuclear Chem.*, 1962, 24, 169.
Dr. B.O. West, Ph.D. Supervisor.
4. The reactions of metal complexes with alkyl halides. Part II. The reactions of halo(triphenylphosphine)cadmium(II) complexes, by G.B. Deacon, *J. Inorg. Nuclear Chem.*, 1962, 24, 1221.
5. Conductances of some group V quaternary 'onium iodomercurate(II) complexes, by G.B. Deacon and B.O. West, *Aust. J. Chem.*, 1963, 16, 579.
Dr. B.O. West, Ph.D. Supervisor.
6. Chemistry of halomercurate(II) complexes, by G.B. Deacon, *Rev. Pure and App. Chem.*, 1963, 13, 189.
7. Tetraethylammonium tetrahalogenozincate(II) complexes with mixed halide ligands, by G.B. Deacon and F.B. Taylor, *J. Chem. Soc.*, 1966(A), 463.
Collaborator: Dr. F.B. Taylor.
8. Far infrared and raman spectra of some crystalline halomercurate(II) complexes, by G.B. Deacon, J.H.S. Green and W. Kynaston, *Aust. J. Chem.*, 1966, 19, 1603.
Collaborators: Dr. J.H.S. Green and Mr. W. Kynaston.

9. The far infrared spectra of tetrahalogenozincate(II) complexes with mixed halide ligands, by G.B. Deacon, J.H.S. Green, and F.B. Taylor, *Aust.J.Chem.*, 1967, 20, 2069.
Collaborators: Drs. J.H.S. Green and F.B. Taylor.
10. The nature of sulphinate coordination in zinc and cadmium arenesulphinates, by G.B. Deacon and P.G. Cookson, *Inorg.Nuclear Chem.Letters*, 1969, 5, 607.
Research student: Mr. P.G. Cookson, B.Sc.(Hons.) student.
11. Preparations, infrared spectra, and structures of some zinc and cadmium arenesulphinates, by P.G. Cookson and G.B. Deacon, *Aust.J.Chem.*, 1971, 24, 935.
Research student: Mr. P.G. Cookson, B.Sc.(Hons.) student.

See also References D9-12 which could alternatively be included in this Section.

SECTION C. Organothallium Compounds

1. Pentafluorophenyl derivatives of thallium, by G.B. Deacon and R.S. Nyholm, *Chem. and Ind.*, 1963, 1803.
Collaborator: Professor R.S. Nyholm.
2. Organothallium compounds. Part I. The preparations and properties of bis(pentafluorophenyl)thallium(III) compounds, by G.B. Deacon, J.H.S. Green, and R.S. Nyholm, *J. Chem. Soc.*, 1965, 3411.
Collaborators: Professor R.S. Nyholm and Dr. J.H.S. Green.
3. Organothallium compounds. Part II. The complexes of bis(pentafluorophenyl)thallium(III) compounds with some neutral unidentate ligands, by G.B. Deacon and R.S. Nyholm, *J. Chem. Soc.*, 1965, 6107.
Collaborator: Professor R.S. Nyholm.
4. A preparative distinction between the donor properties of 1,10-phenanthroline and 2,2'-bipyridyl, by G.B. Deacon, *Inorg. and Nuclear Chem. Letters*, 1966, 2, 299.
5. Organothallium compounds. Part III. Far infrared spectra of halogenobis(pentafluorophenyl)thallium(III) compounds, by G.B. Deacon, J.H.S. Green, and W. Kynaston, *J. Chem. Soc.*, 1967(A), 158.
Collaborators: Dr. J.H.S. Green and Mr. W. Kynaston.
6. Organothallium compounds. Part IV. Carboxylatobis(pentafluorophenyl)thallium(III) compounds and their complexes with 1,10-phenanthroline and 2,2'-bipyridyl, by G.B. Deacon, *Aust. J. Chem.*, 1967, 20, 459.
7. The vibrational spectra of organometallic compounds. Part II. Dialkyl- and diphenyl-thallium(III) compounds, by G.B. Deacon and J.H.S. Green, *Spectrochim. Acta*, 1968, 24A, 885.
Collaborator: Dr. J.H.S. Green.

8. The vibrational spectra of organometallic compounds. Part III. Infrared spectra and assignments for bis(pentafluorophenyl)-thallium(III) compounds, by G.B. Deacon and J.H.S. Green, *Spectrochim. Acta*, 1968, 24A, 1125.
Collaborator: Dr. J.H.S. Green.
9. Organothallium compounds. Part V. Reactions of bis(pentafluorophenyl)thallium(III) compounds with iodide ions, by G.B. Deacon and J.C. Parrott, *J. Organomet. Chem.*, 1968, 15, 11.
Research student: Mr. J.C. Parrott, Ph.D. student.
10. Six coordinate complexes of diorganothallium(III) compounds, by G.B. Deacon and V.N. Garg, *Inorg. and Nuclear Chem. Letters*, 1969, 5, 359.
Research student: Dr. V.N. Garg, Ph.D. student.
11. Element interchange reactions of bromobis(pentafluorophenyl)-thallium(III), by G.B. Deacon and J.C. Parrott, *J. Organomet. Chem.*, 1969, 17, P17.
Research student: Mr. J.C. Parrott, Ph.D. student.
12. Organothallium compounds VI. Reactions of bromobis(pentafluorophenyl)thallium(III) with main group elements, by G. B. Deacon and J.C. Parrott, *J. Organometal. Chem.*, 1970, 22, 287.
Research student: Mr. J.C. Parrott, Ph.D. student.
13. The nature of the sulphinate coordination in some organothallium sulphinates, by G.B. Deacon and V.N. Garg, *Inorg. Nuclear Chem. Letters*, 1970, 6, 717.
Research student: Dr. V.N. Garg, Ph.D. student.
14. Organothallium compounds VII. β -diketonatobis(pentafluorophenyl)thallium(III) compounds and their coordination derivatives, by G.B. Deacon and V.N. Garg, *Aust. J. Chem.*, in press. To appear in 1971, 24, (12).
Research student: Dr. V.N. Garg, Ph.D. student.

SECTION D. Organophosphorus and Organoarsenic Compounds

1. The infrared spectra of quaternary 'onium cations of group VB elements. Part I. Vibrational assignments for some tetramethylphosphonium salts, by G.B. Deacon and R.A. Jones, *Aust.J.Chem.*, 1962, 15, 555. From Ph.D. Thesis.
Collaborator: Dr. R.A. Jones.
2. The infrared spectra of quaternary 'onium cations of group VB elements. Part II. Vibrational assignments for some tetraphenylphosphonium and etc. salts, by G.B. Deacon, R.A. Jones and P.E. Rogasch, *Aust.J.Chem.*, 1963, 16, 360.
Collaborators: Dr. R.A. Jones and Mr. P.E. Rogasch.
3. The infrared spectra of quaternary 'onium cations of group VB elements. Part III. The "X" sensitive vibration near 1100 cm^{-1} , by G.B. Deacon and R.A. Jones, *Aust.J.Chem.*, 1963, 16, 499.
Collaborator: Dr. R.A. Jones.
4. Effect of coordination upon some vibrational frequencies of triphenylphosphine, by G.B. Deacon and J.H.S. Green, *Chem.and Ind.*, 1965, 1031.
Collaborator: Dr. J.H.S. Green.
5. Vibrational spectra of alkylarsonium compounds, by W.R. Cullen, G.B. Deacon and J.H.S. Green, *Canad.J.Chem.*, 1965, 43, 3193.
Collaborators: Professor W.R. Cullen and Dr. J.H.S. Green.
6. The infrared spectra of some mixed alkylarylarsonium salts, by W.R. Cullen, G.B. Deacon and J.H.S. Green, *Canad.J.Chem.*, 1966, 44, 717.
Collaborators: Professor W.R. Cullen and Dr. J.H.S. Green.
7. Assignments of metal-ligand vibrations for triphenylphosphine complexes, by G.B. Deacon and J.H.S. Green, *Chem.Comm.*, 1966, 629.
Collaborator: Dr. J.H.S. Green.
8. The vibrational spectra of some tetra-alkylphosphonium ions, by J.A. Creighton, G.B. Deacon, and J.H.S. Green, *Aust.J.Chem.*, 1967, 20, 583.
Collaborators: Drs. J.A. Creighton and J.H.S. Green.

9. Vibrational spectra of ligands and complexes. Part II.
Infrared spectra ($3650-375\text{ cm}^{-1}$) of triphenylphosphine, triphenylphosphine oxide, and their complexes, by G.B. Deacon and J.H.S. Green, *Spectrochim. Acta*, 1968, 24A, 845.
Collaborator: Dr. J.H.S. Green.
10. Vibrational spectra of ligands and complexes. Part IV.
Infrared spectra of *o*-phenylenebisdimethylarsine complexes of zinc, cadmium, and mercury, by G.B. Deacon and J.H.S. Green, *Spectrochim. Acta*, 1968, 24A, 959.
Collaborator: Dr. J.H.S. Green.
11. Vibrational spectra of ligands and complexes. Part V.
Infrared spectra ($380-40\text{ cm}^{-1}$) of triphenylphosphine complexes of zinc, cadmium, and mercury, by G.B. Deacon, J.H.S. Green and (in part) D.J. Harrison, *Spectrochim. Acta*, 1968, 24A, 1921.
Collaborators: Dr. J.H.S. Green and Mr. D.J. Harrison.
12. Vibrational spectra of ligands and complexes. Part VI.
Infrared spectra of triphenylarsine, triphenylarsine oxide, and triphenylphosphine oxide complexes, by G.B. Deacon and J.H.S. Green, *Spectrochim. Acta*, 1969, 25A, 355.
Collaborator: Dr. J.H.S. Green.

SECTION E. Other Main Group Elements and General
Main Group Element References

1. The solvent properties of trifluoroiodomethane, by G.B. Deacon and B.O. West, *Aust.J.Chem.*, 1963, 16, 1132.
Dr. B.O. West, Ph.D. supervisor.
2. Preparations and infrared spectra of some metal pentachlorobenzoates, by G.B. Deacon and P.W. Felder, *Aust.J.Chem.*, 1967, 20, 1587.
Research student: Mr. P.W. Felder, B.Sc.(Hons.) student.
3. Preparation and properties of some triphenyllead carboxylates, by G.B. Deacon and P.W. Felder, *Aust.J.Chem.*, 1970, 23, 1359.
Research student: Mr. P.W. Felder, Ph.D. student.
4. Syntheses of organometallic compounds by thermal decarboxylation, by G.B. Deacon, *Organometal.Chem.Rev.A*, 1970, 5, 355.
5. The formation of bismuth-carbon bonds via SO_2 elimination, by G.B. Deacon, G.D. Fallon, and P.W. Felder, *J.Organometal.Chem.*, 1971, 25, C10.
Research students: Mr. G.D. Fallon, B.Sc.(Hons.) student and Mr. P.W. Felder, Ph.D. student.
6. Trispentafluorophenylindium compounds, by G.B. Deacon and J.C. Parrott, *Inorg.Nuclear Chem.Letters*, 1971, 7, 329.
Research student: Mr. J.C. Parrott, Ph.D. student.
7. Organoindium compounds. I. Preparative routes to pentafluorophenylindium compounds, by G.B. Deacon and J.C. Parrott, *Aust.J.Chem.*, 1971, 24, 1771.
Research student: Mr. J.C. Parrott, Ph.D. student.

SECTION F. Miscellaneous*

1. Sulphur dioxide insertion into a cobalt(III)-carbon bond,
by K.S. Murray, R.J. Cozens, G.B. Deacon, P.W. Felder
and B.O. West, *Inorg. and Nuclear Chem. Letters*, 1968, 4,
705.
Collaborators: Professor B.O. West and Dr. K.S. Murray.
Research students: Mr. R.J. Cozens, B.Sc.(Hons.) student and
Mr. P.W. Felder, Ph.D. student.

2. S-sulphinates of cobalt(III) planar chelates and sulphur dioxide
insertion into a cobalt(III)-carbon bond, by R.J. Cozens,
G.B. Deacon, P.W. Felder, K.S. Murray and B.O. West,
Aust. J. Chem., 1970, 23, 481.
Collaborators: Professor B.O. West and Dr. K.S. Murray.
Research students: Mr. R.J. Cozens, B.Sc.(Hons.) student and
Mr. P.W. Felder, Ph.D. student.

* These references deal with reactions of sulphur dioxide and sulphinate complexes and hence have a place in the present thesis.

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