FOUNDATIONS OF MODERN EPR

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World Scientific

Singapore • New Jersey • London • Hong Kong

Published by

World Scientific Publishing Co. Pte. Ltd.

P O Box 128, Farrer Road, Singapore 912805

USA office: Suite 1B, 1060 Main Street, River Edge, NJ 07661

UK office: 57 Shelton Street, Covent Garden, London WC2H 9HE

Library of Congress Cataloging-in-Publication Data

Eaton, Gareth R.

Foundations of modern epr / Gareth R. Eaton, Sandra S. Eaton, Kev M. Salikhov.

p. cm.

Includes index.

ISBN 9810232950

I. Electron paramagnetic resonance--History. I. Eaton, Sandra S.

II. Salikhov, K. M. (Kev Minullinovich) III. Title.

QC763.E28 1997

538'.368--dc21

97-41558

CIP

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

Spectra that make up the collage on the cover:

Mn²⁺ in methanol, data from E. Zavoisky, *J. Phys.* **9**, 211 (1945).

Cu²⁺ doped into ZnSO₄(NH₄)₂SO₄·6H₂O, oriented single crystal, data from D. J. E. Ingram, *Proc. Phys. Soc.* **A62**, 664 (1949).

Fremy's salt in solution, data from T. L. Chu, G. E. Pake, D. E. Paul, J. Townsend, and S. I. Weissman, *J. Phys. Chem.* **57**, 504 (1953).

ESEEM of Ce³⁺ in CaWO₄, data from W. B. Mims, K. Nassau, and J. D. McGee, *Phys. Rev.* **123**, 2059 (1961).

Saturation recovery of tanol in *sec*-butyl-benzene, data from M. Huisjen and J. S. Hyde, *Rev. Sci. Instrum.* **45**, 669 (1974).

2D-ELDOR of tempone, data from J. Gorchester, S. B. Ranavavare, and J. H. Freed, *Bull. Magn. Reson.* **11**, 305 (1989).

First published 1998

Reprinted 1999

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Printed in Singapore by Regal Press (S) Pte. Ltd.

PREFACE

"There are spins everywhere" said one of our colleagues, and EPR is the best way to study many of the unpaired electrons. The physics of spins continues to challenge theorists and experimentalists. Naturally occurring unpaired electrons, spin probes, and spin labels provide unique insights into the nature of substances, their structure and reactivity, from materials science to medicine. From the modest beginnings of Zavoisky's first experiments 50 years ago, and the elegant elaboration in Bleaney's lab, to the multidimensional, CW and pulsed EPR of today, there have been numerous benchmark experiments and calculations by many insightful scientists. In this book we celebrate both the beginnings of EPR and the vistas now open to science via the powerful new applications of paramagnetic resonance.

Authors were urged to include the classic experiments that led to EPR becoming such an important element in modern physics, chemistry and biology, and the ways in which earlier work led to present day techniques and applications. We also asked some of the authors to succinctly describe the state-of-the-art and point the way to future developments of EPR and applications of EPR. In order to sample even a small portion of the vast scope of EPR, authors were told that brevity is a virtue, because of the large number of contributors. Beyond these strictures, though, the editors have let the style and the personalities of the authors show through. Individual contributions range from brief reminiscences to formal reviews. Some authors have provided very personal anecdotes about how they came to make their discoveries, and have revealed their stimuli and motives in a way that never happens in regular research papers. Others said of this request, for example, "I just can't produce it."

While seeking the advice of colleagues about topics to include, and people to invite to contribute, the enormous reach of EPR spectroscopy quickly made it evident that comprehensiveness was beyond the financial constraints of the publishing industry. The scope of EPR is such that one person cannot grasp it all, and sub-fields have grown up that rarely communicate with each other. We hope that this book will not only enrich by revealing some of the majesty of this field, but also give scientists an enhanced awareness of the origins of this thing they call EPR (or ESR or EMR!). Within the constraints of a finite number of pages, we sought to sample from physics, chemistry, biology, continuous wave, time domain, first experiments and state of the art, etc. Overall, the goal was to give a flavor of the way things were, of the present state-of-the-art, and of the bright future.

Even with the large number of illustrious contributors, there are some obvious absences. Some people for various reasons could not accept the invitations to contribute, and some early workers could not be located. Serendipity helped in some cases, too. We did not know how to locate Jack Castle. When two of the editors were celebrating their 25th wedding anniversary on a trip to Alaska, they found themselves talking to Jack over breakfast in Denali National Park, Alaska. Soon Jack had agreed to write two chapters.

In addition to being reviewed by the three editors, each chapter was reviewed by experts in each area, as for a scientific journal. We thank these anonymous referees for their contribution to the quality of this book. Without them we would have missed some important improvements. International communications are still not as efficient as we in science would like (some international express delivery services had no idea where Kazan was!), and this resulted in some delays in publication. The Soros Foundation helped Kev Salikhov travel to Denver to attend the International EPR Symposium at a critical juncture in the preparation of this book. Without electronic mail the editors would still be responding to letters that passed each other in the mail. Independently, the Soros Foundation also contributed to making email possible in the former Soviet Union, and hence they are to be thanked for their indirect assist.

Most of all, the editors thank the authors, who took time out of busy schedules to provide their unique perspectives. Their cooperative enthusiasm for this venture, and good nature in adapting to the goals we set for the book, made our task easier. We also learned a lot from what they wrote, and we hope the readers will find profitable enjoyment in each chapter as we did.

Sandra S Eaton and Gareth R. Eaton, Denver, June, 1997

Kev Salikhov, Kazan

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