PARAMAGNETIC RESONANCE

PROCEEDINGS OF THE FIRST INTERNATIONAL CONFERENCE HELD IN JERUSALEM, JULY 16–20, 1962

Edited by

W. LOW

Department of Physics

The Hebrew University of Jerusalem, Israel

Volume I

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Volume V

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PREFACE

This volume contains a collection of papers of the First International Conference on Paramagnetic Resonance held at the Hebrew University of Jerusalem, Israel on July 16–20, 1962. The conference was sponsored by the Hebrew University of Jerusalem, Israel, the International Union of Pure and Applied Physics, and the Israel Academy of Sciences and Humanities.

This conference summarized the advances which have taken place during the last 16 years since the discovery of electron spin resonance by Zavoisky. It also indicated the areas of major interests in this particular field. The topics in this conference were restricted essentially to solids. The major sections of these papers dealt with the electron spin resonance in the iron group and the rare earth groups, the theory related to these spectra, the effects of electric fields, pressure and temperature on these spectra. It discussed the advances in our knowledge of the relaxation phenomena which seem to be now reasonably well understood. Review papers on electron spin resonance in semi-conductors and in biological materials summarizes the results of the last few years in this field. Finally, there were a few selected papers on spin resonance of F centers, organic materials and in glasses.

About 180 scientists from 16 countries participated in this conference. The organizing committee wishes to express its gratitude to all the institutions which have generously assisted in making this conference possible. In addition to the three sponsoring bodies, valuable assistance has been extended by the Charles F. Kettering Foundation, the Office of Naval Research and the Israel National Council for Research and Development. We are also indebted to the National Science Foundation, the Royal Society and other national organizations for the travel support given to many of the scientists.

It is a pleasure to acknowledge the efforts of the Local Arrangements Committee, the Department of Physics of the Hebrew University, and in particular of Mrs. H. Lehrer in planning and running a smoothly conducted conference and in providing an interesting series of social events.

W. Low

Jerusalem, December, 1962

בע"ה, עיה"ק, ירושלים, תשכ"ג

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PART II: ESR SPECTRA OF RARE EARTH AND URANIUM ELEMENTS

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PART I

ESR SPECTRA OF IRON GROUP ELEMENTS

A.

Paramagnetic Resonance of Transition Metal Ions in Rutile (TiO_2)

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ABSTRACT

A review and discussion of paramagnetic resonance on eighteen different ions in TiO_2 will be given, with emphasis on charge, lattice site and crystal field considerations.

Introduction

Rutile (TiO_2) is a crystal with tetragonal symmetry. Thick crystals are slightly yellow due to the fundamental absorption of the crystal which sets in at about 4300 Å [1]. There are two lattice sites at which the Ti^{4+} ions are located. These sites are identical except for a 90° rotation around the tetragonal axis (see Figure 1a). The local surroundings of this site has cubic symmetry with a rather small orthorhombic distortion. The lines

Part of rutile lattice showing the two substitutional Ti^{4+} positions.

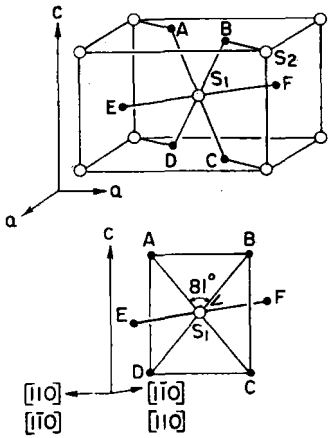

Figure 1a

Part of rutile lattice showing the four interstitial positions.

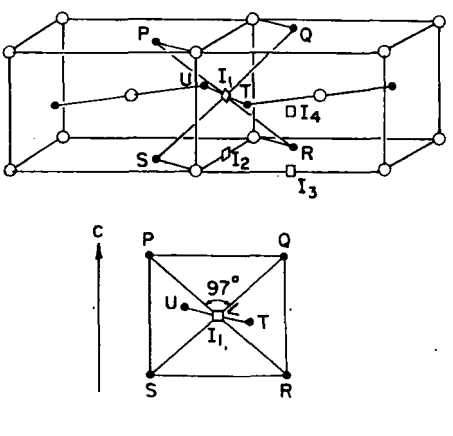

Figure 1b

SA = SB = SC = SD = 1.94Å
SE = SF = 1.99Å
○ = Ti^{4+}
• = O^{2-}
□ = Interstitial position

IP = IQ = IR = IS = 2.23Å
IU = IT = 1.67Å

Substitutional and interstitial lattice positions in TiO_2

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