Construction of an electron spin resonance spectrometer and the measurement of the hyperfine solution spectrum of copper salicylaldimine

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A.J.M.

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PART 2

This work, except where otherwise stated is, according to the author's knowledge and belief, entirely original and contains no material which has been previously presented in any University either by the author himself or by any other person.

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SUMMARY

Part 1

A description of the operation and principles of an electron spin resonance spectrometer is given together with a comparison of the various types in common use. The advantages of using a resonant cavity as a sample holder and the necessity for klystron frequency locking are shown together with a description of the various types of magnetic field modulation that can be employed. The construction of a 3 cm electron spin resonance spectrometer using 100 kc magnetic field modulation is described in detail together with the design of magnetic field stabilising and sweeping circuits. Details are given of the construction of a proton resonance magnetometer for precise field measurement. Finally the method for determining the spectrometer sensitivity is described.

Part 2

Studies of the hyperfine spectrum of copper salicylaldimine in solution have been experimentally made. The spin Hamiltonian for a tumbling paramagnetic complex is described and the linebroadening is shown to depend on the rotational speed of the complex. Solvents of differing viscosities were used and also the effective planar area of the microcrystal was altered by the addition of aliphatic chains to the basic chelate. The linewidths of the four line spectrum obtained were analysed by fitting four equal area Lorentzian curves by means of an iterative process. The necessity for using eight parameters in the curve fitting required the writing of the curve fitting procedure in FORTRAN and the use of a computer.