

MÖSSBAUER EFFECT IN FERROCENYL CARBONIUM ION

Joseph J. Dannenberg and John H. Richards

Gates and Crellin Laboratories of Chemistry,* California Institute of Technology,
Pasadena, California 91109

(Received in USA 10 August 1967)

We should like to report the Fe⁵⁷ Mössbauer effects in ferrocenylcarbonium ion and ferrocenylcarbinol in frozen solution.

The measurements were made at 137°K utilizing a Co⁵⁷ source diffused into metallic chromium. The carbonium ion was prepared by dissolving ferrocenylcarbinol in concentrated sulfuric acid. Freezing point depression measurements confirm the existence of the carbonium ion under these conditions (1). The carbinol was in benzene solution. An absorber thickness of 1 mm. of 40 mg./ml. solutions was used in both cases. More complete experimental data will be reported subsequently. The isomer shifts and quadrupole splittings obtained are listed in Table I.

TABLE I
Mössbauer Effect Data

	Isomer Shift (mm./sec.)	Quadrupole Splitting (mm./sec.)
Ferrocenylcarbinol	0.56	1.99
Ferrocenylcarbonium Ion	0.57	2.29

The virtual identity of the isomer shifts of the carbonium ion and the carbinol indicate that there is probably a relatively small difference in the electron density at the iron nucleus between these two species. Iron coordinates only sixteen electrons (rather than eighteen as in ferrocene and ferrocenylcarbinol) in the model, I, for the carbonium recently suggested by

*Contribution No. 3553.

Acknowledgements: We should like to thank Dr. E. Kankeleit for allowing us to use his equipment and for many useful discussions, and the National Science Foundation (NSF-GP-5190) for support.

REFERENCES

- (1) M. Cais, J. J. Dannenberg, A. Eisenstadt, M. I. Levenberg, and J. H. Richards, Tetrahedron Letters, 1695 (1966).
- (2) J. D. Fitzpatrick, L. Wattson, and R. Pettit, Tetrahedron Letters, 1, 1299 (1966).
- (3) A. V. Lesikar, J. Chem. Phys., 40, 2746 (1964).
- (4) E. A. Hill and J. H. Richards, J. Am. Chem. Soc., 83, 3840 (1961).
- (5) J. J. Dannenberg, Ph. D. Thesis, California Institute of Technology, 1966; J. J. Dannenberg, M. I. Levenberg, and J. H. Richards, to be published.
- (6) G. K. Wertheim and R. H. Herber, J. Chem. Phys., 38, 2106 (1963).
- (7) G. K. Wertheim and R. H. Herber, J. Am. Chem. Soc., 84, 2274 (1962).