

interesting that the infrared spectrum of our adduct shows a strong band at $1,600\text{ cm}^{-1}$ as well as those in the $2,100\text{--}1,800\text{ cm}^{-1}$ region reported previously⁵. Possibly this is another example of coordination of aluminium to the oxygen atom of a carbonyl group bonded to a transition metal⁶.

Accurate band maxima in spectrum (c) measured at 430 atmospheres and 195° C occur at $2,067$, $2,042$ (shoulder), $2,030$, $2,023$ (shoulder), and $1,860\text{ cm}^{-1}$. The relative intensities of the bands at $2,030$ and $2,023\text{ cm}^{-1}$ are inconsistent with the formation of only the non-bridged isomer of $\text{Co}_2(\text{CO})_8$ (in the latter species the intensity of the $2,030\text{ cm}^{-1}$ absorption is much less than that of the $2,020\text{ cm}^{-1}$ band³) and therefore changes other than those which can be attributed to isomer effects must be invoked. The most obvious possibility is the addition of carbon monoxide to form $\text{Co}_2(\text{CO})_9$, and the effect of pressure variation on the spectrum supports this suggestion.

Possible structural species for $\text{Co}_2(\text{CO})_9$ are the ionic dissociated structure $[\text{Co}(\text{CO})_5]^+ [\text{Co}(\text{CO})_4]^-$ (I), the cobalt analogue of $\text{Fe}_2(\text{CO})_9$ with three bridging carbonyl groups (II), and a structure containing two $[\text{Co}(\text{CO})_4]$ units joined by one bridging carbonyl group (III). Structure (I) is immediately eliminated by the absence of the strong band at about $1,883\text{ cm}^{-1}$ characteristic of $[\text{Co}(\text{CO})_4]^-$ (ref. 7). Of the two remaining structures, (II) seems less likely than (III) on symmetry grounds. First, there are more bands than can be accounted for on the basis of the D_{3h} symmetry of (II), and second, the bridging carbonyl frequency corresponding to such a structure is of the doubly degenerate E' species which should have strong intensity.

Thus a strong band at $1,829\text{ cm}^{-1}$ is observed in the infrared spectrum of $\text{Fe}_2(\text{CO})_9$ (ref. 8), whereas, in contrast, spectrum (c) shows only a weak absorption at $1,860\text{ cm}^{-1}$. Structure (III) is similar to that proposed for the recently characterized diosmium enneacarbonyl⁹. In the latter case, the osmium atoms are joined by a metal-metal bond in addition to the bridging carbonyl group. For a species of this type with C_{2v} symmetry, a total of eight infrared active carbonyl stretching frequencies are predicted, but this does not take into account the possibility of accidental degeneracies and that some bands may be weak and not resolved. In spectrum (c) a total of five bands are observed and the overall pattern of frequencies is similar to that reported for $\text{Os}_2(\text{CO})_9$. On this basis structure (III) is favoured, although of course an unequivocal assignment cannot be made.

In conclusion, the spectra observed are consistent with an interaction between carbon monoxide and $\text{Co}_2(\text{CO})_8$ at high pressures and temperatures, which may be interpreted in terms of the formation of $\text{Co}_2(\text{CO})_9$ containing two $\text{Co}(\text{CO})_4$ units bridged by a single carbonyl group.

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Ohio Source Counts: Comments by Harris and Kraus

Jauncey and Niell¹ point out that the flux densities of sources in the Ohio survey tend to be underestimated at low values of flux density. We have been aware of this from independent measurements by Dixon, Ehman, and others of the OSU Radio Observatory staff, made in 1969 with the NRAO 300 foot radio telescope at Green Bank. The principal cause of the underestimation was traced to an error in data reduction which affected certain sources. Corrections can be made for the individual sources affected. For many statistical purposes, however, a satisfactory correction is to increase the flux density of all sources with $0.16 \leq S_{1.415} < 0.5$ flux units by 0.07 flux units for instalments II and III of the Ohio survey and by 0.03 flux units for instalment IV.

Jauncey and Niell imply that this underestimation of flux density affects the results of the number count studies that we reported earlier². We wish to emphasize, however, that (1) the errors reported by Jauncey and Niell refer only to instalments II and III which they sampled and not to the Ohio survey as a whole (more than half of the sources used in the count statistics are from instalment IV and the errors for this instalment are smaller); (2) the above errors in flux density are well within those quoted in the individual Ohio survey instalments; and (3) although the underestimation effect was unknown to us when we prepared our article (ref. 2) the resulting number count errors are within those given in our Table 2 (ref. 2).

So although the underestimation error has some effect on the number count statistics, it is sufficiently small that it does not alter our conclusions. Instalment V (Brundage, Dixon and Kraus, in preparation) is considerably more complete at the survey limit than the previous instalments and we plan to interpret the significance of these new counts in a subsequent article.

Note added in proof. We expect, as confirmed by Jauncey and Niell¹, a scatter of between 0.1 and 0.2 f.u. in the measured Ohio flux densities for sources weaker than 0.5 f.u. It is incorrect to compare this scatter with the r.m.s. confusion error of 0.05 f.u. in Harris and Kraus², as Jauncey and Niell have done.

It is clearly stated in Harris and Kraus² that the 0.05 f.u. refers to an effective standard deviation in flux density error due to confusing sources weaker than the limit of the Ohio survey; because this limit lies near the maximum of the non-Gaussian confusion error distribution, the actual errors due to all confusing sources are larger. This was fully taken into account in our article; therefore the criticisms by Jauncey and Niell of our interpretation are invalid.

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