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Preliminary communication

FORMATION OF AN *N,N'*-DISUBSTITUTED UREA FROM A METAL CO-ORDINATED BIS(ARYLAMINO)CARBENE

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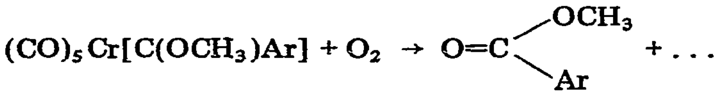
Summary

N,N'-Di-*p*-tolylurea is obtained on stirring in air an aqueous acetone solution of the carbene complex of gold(III) $[trans\text{-}\{(p\text{-}MeC_6H_4NH)_2C\}_2AuI_2]ClO_4 \cdot Et_2O$.

Recently Fischer has reported [1] the isolation of carbonyl derivatives by reaction of a coordinated carbene complex with oxygen according to the reaction as in eqn. 1.



$$(CO)_5Cr[C(OCH_3)Ar] + O_2 \rightarrow O{=}C\begin{smallmatrix}\nearrow OCH_3 \\ \searrow Ar\end{smallmatrix} + \ldots \qquad (1)$$

Other examples of oxidation of coordinated carbenes are known, but all involve the participation of a powerful oxidizing agent such as Ce^{IV} [2] or pyridine *N*-oxide [3].

While investigating the reactions of carbene complexes of gold(III) [4], we found that when a solution of $[trans\text{-}\{(p\text{-}MeC_6H_4NH)_2C\}_2AuI_2]ClO_4 \cdot Et_2O$ in 50% aqueous acetone was stirred overnight, a white precipitate was formed, which was identified as *N,N'*-*p*-tolylurea (ca. 40%) by complete elemental analysis and by comparison with an authentic sample. No other product was isolated from the solution, which was acidic and colourless, since extensive decomposition occurred on further treatment (e.g. vacuum evaporation). Unstable red crystals, having the same composition as the starting compound except for acetone in place of diethyl ether, could be isolated by filtration from the starting solution after ca. 1 hour. They react in the same way as the ether-containing complex, while the related gold(I) complex, $[\{(p\text{-}MeC_6H_4NH)_2C\}_2Au]ClO_4$, is stable under the same conditions. No reaction occurs if chloroform is used as solvent in place of aqueous acetone.

The gold(III) compound is thus shown to be an unusually reactive carbene complex, and the reaction may be a synthetically useful route to some derivatives of carbene ligands. Other ureas, e.g. p-$MeC_6H_4NHCONHMe$, were obtained similarly.

The oxidation could involve as the effective reagent (i) water (eqn. 2),

$$\{(RNH)_2C\}\,Au^{III} + H_2O \rightarrow 2\,H^+ + (RNH)_2C{=}O + (Au^I) \qquad (2)$$

(ii) atmospheric oxygen, (iii) the perchlorate anion, or (iv) acetone. The available evidence suggests that water is the most likely; additional information on the mechanism is being collected, and the investigation extended to other carbene ligands, e.g. (RNH)(R′O)C.

Acknowledgements

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References

1 E.O. Fischer and S. Riedmüller, Chem. Ber., 107 (1974) 915.
2 C.P. Casey and T.J. Burkhardt, J. Amer. Chem. Soc., 94 (1972) 6453.
3 F.A. Cotton and C.M. Lukehart, J. Amer. Chem. Soc., 93 (1971) 2672.
4 G. Minghetti and F. Bonati, J. Organometal. Chem., 54 (1973) C62.