

SYNTHESIS AND PROPERTIES OF CHLOROTRIS(1,3-DIBENZYLIMIDAZOLIDIN-2-YLIDENE)RHODIUM(I) AND OF SOME RELATED COMPOUNDS

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ABSTRACT. The electron-rich alkene $\{\overline{\text{CNR}(\text{CH}_2)_2\text{NR}}\}_2$ (L_2) ($\text{R} = \text{CH}_2\text{Ph}$) has been used as a source of various carbenorhodium(I) complexes: $[\text{RhCl}(\text{cod})(\text{L})]$ (1), $[\text{RhCl}(\text{L})_3]$ (2), $[\text{RhCl}(\text{CO})(\text{L})_3]$ (3), and *trans*- $[\text{RhCl}(\text{CO})(\text{L})_2]$ (4), and of the iridium(I) complex $[\text{IrCl}(\text{L})_3]$ (5). Compounds (2) and (5) are of particular interest as they contain no other neutral ligand apart from the carbene $:\overline{\text{C}}\text{N}(\text{R})(\text{CH}_2)_2\text{NR}$ (L) ($\text{R} = \text{CH}_2\text{Ph}$); their chemistry is in many ways related to that of the well known complexes $[\text{MCl}(\text{PPh}_3)_3]$ ($\text{M} = \text{Rh}$ or Ir). Thus, compound (2) readily loses a carbene ligand upon treatment with either carbon monoxide [ultimately to lead to (4)], or O_2 to yield a compound tentatively formulated as $[\text{RhCl}(\text{L})_2(\text{O}_2)]$ (6). The X-ray structures of complexes (2) and (4) have been determined.

1. Introduction

The objectives of this work were to investigate the potential of the electron-rich alkene $\{\overline{\text{CN}(\text{CH}_2\text{Ph})(\text{CH}_2)_2\text{NCH}_2\text{Ph}}\}_2$, abbreviated as $[\text{LCH}_2\text{Ph}]_2$, particularly in the context of the chemistry of derived carbenometal complexes of rhodium(I) and iridium(I). Previously we have examined extensively a similar series of electron-rich alkenes $[\text{L}^{\text{R}}]_2$ (in which $\text{R} = \text{Me}$, Et , or Ph).¹ A limited amount of work has also been carried out on $[\text{LCH}_2\text{Ph}]_2$ in the context of Ru^{II} and Os^{II} chemistry.²

In much of the transition metal chemistry of compounds $[\text{L}^{\text{R}}]_2$, the alkene behaved as a C-centred nucleophile giving rise to carbenometal complexes, e.g., the reaction of $[\text{Au}(\text{Cl})\text{PPh}_3]$ with $[\text{L}^{\text{Me}}]_2$ gave $[\text{Au}(\text{L}^{\text{Me}})_2]\text{Cl}$.¹ Thus, it is evident that in many ways the electron-rich alkene behaves in an analogous fashion to a tertiary phosphine. Moreover, some compounds, e.g., *cis*- $[\text{RhCl}(\text{cod})(\text{L}^{\text{Me}})]$ [$\text{L}^{\text{Me}} = :\overline{\text{CN}}(\text{Me})(\text{CH}_2)_2\text{NMe}$], have been shown to display catalytic properties similar to their tertiary phosphine equivalents.³